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Theta Pro2Serve Management Company, LLC

PORTSMOUTH INFORMATION RELEASE APPROVAL REQUEST

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Audience: ☐ Public Meeting ☐ Private Meeting ☐ Presentation to Congress
☐ Distribution List ☐ Internet Publication ☒ Publication/Press Release

Justification: DOE wants to put on website for potential D&D bidders

Requestor: Amanda Mayo Ext. 2669 Date: 5/2/08
Legible Signature or Print Name & Signature

II. Patent, Classification and Protected Information Review
To be completed by the PORTS Classification Office)

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☑ Does not Contain Patentable or Proprietary information
☐ Contains Patentable or Proprietary and/or has clearance patent information

Classification Review:
☑ Document is Unclassified
☐ Document is Classified

Sensitive Information Review:
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J. W. Thomas 5/12/08
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436.1m-115

DECONTAMINATION AND DECOMMISSIONING LESSONS LEARNED

The objective of this document is to compile the Decontamination and Decommissioning (D & D) lessons learned from across the DOE complex. Because other DOE sites are faced with similar challenges, including reduced funding and shortened schedules, DOE has determined that lessons learned should be communicated across the complex to improve facility disposition programs. Lessons learned from throughout the DOE complex should provide established precedence and flexibility through applicable or relevant and appropriate regulations (ARARs)/technical equivalency during completion of the D & D mission.

D & D activities at DOE Oak Ridge facilities are specifically applicable to the Portsmouth Gaseous Diffusion Plant (PORTS). Oak Ridge started decommissioning their GDP facilities in 1997. Their experience has been extremely valuable in addressing and resolving the technical issues and problems of D & D for these plants. All aspects of GDP D & D have been demonstrated and the current goal is to capitalize on this experience and to improve efficiencies during the PORTS D & D.

The lessons learned presented in this document have been organized and arranged following the current Pre-D & D planning pie chart (Attached figure). Each lesson learned is presented as a title and summary. The detailed description and/or full text of the lesson learned will be contained in a searchable lessons learned database. The eight Pre-D & D Planning area's include:

1.) Project Acquisition
2.) Lease Transition/Infrastructure, Land Use, and Real Property Management
3.) Regulatory Framework
4.) Program Management
5.) Miscellaneous Initiatives
6.) Authorization Basis Transition
7.) CD-0/1 and Revised Estimate
8.) CERCLA (EE/CA and Disposal cell)

These area's are subject to revision as the Pre-D & D planning progresses.

The lessons learned contained in this document were compiled from the following sources:

-The BechtelJacobs Company intranet Lessons Learned database
-An online search through numerous DOE databases
-Review of lessons learned meeting minutes from Oak Ridge D & D projects
-Limited interviews of onsite PORTS personnel with D & D experience

Additional lessons learned will be captured after meetings, onsite demonstrations, and personnel interviews with D & D experienced personnel from the Three Building D & D ((BNFL) K-29, K-31, and K-33) and K-25/K-27 D & D Projects in Oak Ridge. These meetings and demonstrations have tentatively been scheduled for mid to late October, 2005. Online searches and site specific phone inquiries to DOE facilities with ongoing D & D activities will continue.

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- ☐ Document is Classified

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436.1m-114

Lessons Learned

1.0 Project Acquisition

1. **Title:** Cut Energized Power Line
   Summary: Inattention to detail/work being performed could result in injury or even death. Do not deviate from approved work scope. Ensure lockout/tagout requirements are implemented and verified correctly. Electrical subcontractors must verify LO/TO per Activity Hazard Analysis requirements. Only qualified BWXT Pantex personnel are authorized to de-energize systems. Subcontract Technical Representatives (STRs) and subcontractors are required to secure the area and immediately report to the Operations Center when an incident does occur.

2. **Title:** 211-42F- Unexpected Radiological Material – Emphasizes Work Planning and Hazard Analysis (SRS)
   Summary: Though this lessons learned discusses a WSRC Site D&D event, it has important lessons for all employees, particularly regarding job planning and hazard analysis issues.

   Specific To This Event

   - Safe and effective work - deactivation and decommissioning (D&D) work in this case - is dependent upon thorough upfront planning. Specifically, engineering and work planning walkdowns must be conducted with a degree of thoroughness and attention to detail that leaves little to chance. If these are not properly accomplished, there could be radiological safety issues and work delays.

   - All work package reviewers must conduct thorough initial and final reviews to ensure initial adequacy and to identify scope changes that may affect hazards mitigation and PPE requirements.

   - Look for process components that could be involved in hazard mitigation (e.g., HEPA filters). In this event, a HEPA filter was attached downstream of the line break but was not recognized during the walkdowns. The HEPA housing was not the typical housing that is commonly used throughout the Savannah River Site. Also, the system process must be fully understood in order to gain an appreciation for the hazards associated with the process.

3. **Title:** 247-F Acid Spill - Emphasizes On-The-Job Awareness (SRS)
   Summary: Though this lessons learned discusses a WSRC Site D&D event, it has important lessons for all employees, particularly on-the-job awareness issues.

   Specific To This Event - Evaluate awkward work positions. In this case, positions that could cause acid suit overlaps to open and reduce the amount of protection provided by the PPE. - To the maximum extent practical, position personnel at a convenient

working level relative to their work area; the least desirable position is below the hazard. - Emphasize PPE as a last line of protection used for splashes of liquid (not flowing liquids). Personnel should immediately recognize the need to move away from flowing liquids from unexpected sources.

4. **Title:** Minor Shock from Improperly Grounded Subcontractor-Supplied Equipment
   Summary: An FH deactivation and decommissioning (D&D) subcontractor received a minor shock from subcontractor-supplied equipment, which had an improperly terminated ground wire. The equipment was not listed by a Nationally Recognized Testing Laboratory (NRTL) or labeled by a qualified UL 508A firm.

5. **Title:** Residual Nitric Acid Spilled from Pipe and Burns Worker
   Summary: A small amount of liquid spilled from a pipe being cut as interference removal. The liquid penetrated a pair of leather gloves and surgeon's gloves, causing a small red spot on the responding Radiological Control Technician's (RCT) hand. No personnel were contaminated but high levels of contamination were detected on personal protective clothing and in the surrounding area.

6. **Title:** Worker Protection During D&D Activities
   Summary: In order to minimize personnel contamination, heat stress, and other health and safety concerns, Decontamination and Deactivation (D&D) activities must be thoroughly reviewed prior to commencement and all anomalies encountered during the hands-on D&D activity must be effectively communicated to site personnel.

7. **Title:** A Team Risk/Hazard Analysis Approach to Effective Facility Decommissioning
   Summary: During deactivation of the Whole Body Neutron Irradiation Facility (WBNIF) and the Prompt Gamma Neutron Activation Facility (PGNAF) at Brookhaven National Laboratory (BNL), a total of 640 curies of Plutonium-Beryllium (PuBe) were targeted for removal to include special form encapsulation and packaged for disposal. The project team evaluated the hazards and devised a plan to mitigate or eliminate each hazard, and ensure that dose received conformed to As Low As Reasonably Achievable (ALARA) practices and standards. Team members from Isotopes and Special Materials, Emergency Management, Waste Management, Internal Audit and Oversight, Medical-Life Sciences, Safety and Health Services and Radiological Control personnel employed a "Team Risk/Hazard Analysis" approach throughout the planning (i.e. plan development, briefings, mock ups & walkthroughs) and execution phases of the project. This team approach led to the successful removal and encapsulation of 640 curies of PuBe sources.

8. **Title:** Personal Clothing Contamination in K-25 Building

Summary: During decontamination and decommissioning activities of facilities that are known to be contaminated, care must be exercised when performing any type of work in and around equipment. Reevaluation of personal protective equipment (PPE) requirements should be performed periodically, especially if the facility roof is leaking, or other types of environmental exposure is occurring which could cause redistribution of contamination.

9. **Title:** Temporary Pipe Repairs to Provide Containment of Internal Contamination Need to Consider Weather Exposure

Summary: Intrusive work into process systems, auxiliary lines, or containers such as pipes and tanks existing at former gaseous diffusion plants should consider the potential for internal contamination. Two events occurred during the demolition of vent lines with known internal contamination. Both vent lines were sectioned using a portable band saw. The saw cuts were performed within plastic glovebags (similar to those used in asbestos abatement). The plastic glovebags were secured to the opposite sides of the planned cuts with duct tape. After the lines were sectioned, portions of the glovebag formed the first layer of temporary closures for each section of pipe. Due to work process controls, the pipe sections with temporary contamination control containment consisting of duct tape and plastic were exposed to separate significant rainfall events. When the first line was eventually lowered, fluid was observed to discharge from both ends of the pipe section. Contamination was discovered where this fluid contacted the ground. The second event occurred approximately one (1) month later on a vertical vent line. Two areas of asphalt and a truck bed were contaminated. Whenever a line is breached there is opportunity for contamination to spread. It may not be possible to reseal opened systems using the removed components without additional repair or replacement. If temporary containment, such as plastic and duct tape, is installed to prevent the spread of contamination, it should be protected from the weather and maintained. Otherwise construct pipe closures of durable materials that will withstand the weather conditions. Plastic and tape will degrade if exposed to weather conditions and are not suitable for long-term containment of removable contamination. Cold temperatures and or wet conditions can ruin temporary containment systems constructed with duct tape and plastic. Therefore, use alternatives to the duct tape and plastic pipe closures when the repair is exposed to or must be applied in adverse weather conditions.

10. **Title:** Workers Exposed To Toxic Gas Leak

Summary: When performing activities with uncharacterized materials, effective work control practices and job planning processes to address potential hazards should be applied. Controls and plans should reflect the importance of ensuring that systems containing toxic materials are isolated properly after they have been operated.

The controls and plans should also reflect the importance of wearing personal protective equipment, including self-contained breathing apparatus appropriate for worst-case exposures, when working in areas containing toxic substances.

11. **Title:** Hot Slag Ignites Flexible Exhaust Duct at NRC Facility
Summary: Timely identification by the fire watch of a fire started by hot slag while performing cutting and welding operations prevented serious injury to the welders.

12. **Title:** Chemical Explosion at Hanford
Summary: The purpose of this notice is to advise you of a serious event so that you will take appropriate actions at your facilities to avoid a similar occurrence.

13. **Title:** Migration of Contamination Through Anti-Contamination Clothing
Summary: When determining types of personnel protective equipment (PPE) to use for a job, it is important to evaluate the physical aspects of the work to be done and the environment that the work will be done in to select the best PPE for the job.

14. **Title:** LOCKOUT/TAGOUT - IMPROPER REMOVAL
Summary: Improperly removed lockout/tagouts have created hazardous conditions.

The formal version of DOE Just-In-Time 2005-04 is available at:

(You must have Adobe Acrobat Reader (r) to view this file.)

15. **Title:** Source Control - Correct Facility Hazard Categorization
Summary: DOE STD-1027-92, Hazard Categorization and Accident Techniques for Compliance with DOE Order 5480.23, stipulates that sealed sources that meet the requirements of DOT 49CFR 173.469 or ANSI N43.6 may be excluded from a Facility's radioactive inventory.

In this case, it is not clear that sufficient documentation exists to meet this requirement.

All facilities with radioactive sealed sources need to be aware of the requirements for the special forms exemption under DOE-STD-1027 and how their safety basis documentation credits the integrity of the source capsule relative to this exemption.

16. **Title:** Presence of Process Gases in Non-Process Systems
Summary: While performing asbestos remediation activities for decontamination and decommissioning (D&D) of a shutdown gaseous diffusion plant (K-27 building), a small quantity of residual process gas was released from a non-process line when it was bumped. Hazardous substances used during plant operations may migrate after plant shutdown and appear in unexpected locations. Reliance on process descriptions, prior documentation of facility

operating history, shutdown description documents and facility walkdowns may not adequately identify the potential for hazardous substances/materials to be present in unanticipated locations and released during D&D. Consequently, personnel must be made aware of the risk for hazards to exist in the work area other than those directly associated with the work being performed.

17. **Title:** Personnel Protective Equipment Prevents Injury
Summary: An effective Activity Hazard Assessment (AHA) and use of proper personnel protection equipment can protect project personnel from potentially serious injuries.

18. **Title:** Equipment Damaged During Demolition
Summary: Extreme caution must be taken and a thorough hazards analysis performed when two pieces of heavy equipment are operating in close proximity. As work allows, equipment should be moved outside the swing radius of adjacent operating equipment.

In this case, the two operators correctly agreed that the grappler needed a spotter to safely move a section of wall. As an additional caution, the shear operator could have moved the shear away from the grappler before shutting down and exiting the cab to perform as a spotter. Leaving the shear inside the swing radius of the grappler contributed to this accident.

More than one spotter is sometimes necessary to safely operate heavy equipment in congested work areas. One spotter cannot effectively monitor the movement of material and simultaneously assure all clearances are adequate as the cab rotates. This is particularly true when two pieces of heavy equipment are operating next to each other (i.e., the grappler holds the section of wall while the shear makes the cuts to free it).

When work scope significantly changes, the work plan, hazards, and controls should always be reevaluated.

NOTE: Although not relevant to this Lessons Learned, designated spotters should not be assigned additional responsibilities that could interfere with properly performing their job as spotters.

19. **Title:** Inadequate Removal of Overhead Ductwork in 421-2D (SRS)
Summary: Though this event occurred during D&D activities, there are lessons to be learned by all work groups regarding work planning and hazard analysis.

- Don't do work that doesn't need to be done.

This ductwork was radiologically clean, securely fastened, and presented no apparent safety or structural problem. It could have simply come down with the building.

- Use the Incidental Rigging methods covered in training, and follow the controls in the work package.

Training provides the correct Incidental Rigging methods and should be used. The work package included controls that would have prevented this event.

- When an unexpected event occurs, suspend work and notify management immediately

20. **Title:** Subcontractor Work Outside of Scope of Work Results in Breach of Contaminated Piping

Summary: When any work is being performed (by subcontractors in this instance), it is imperative that the scope of work is well defined and the workers are made aware of particular hazards that may exist in the work area.

All workers must follow the scope of work, be aware of hazards, and have a questioning attitude during the performance of work. Employees should Stop Work immediately and report to supervision when work scope and/or conditions change.

21. **Title:** Glovebox Fire

Summary: Keeping combustibles in a contaminated glovebox, not performing adequate combustible control inspections, and not performing adequate hazard identifications and analysis are all precursors that can lead to glovebox fires with a possible associated contamination release.

22. **Title:** Exothermic Reaction During Tank Foaming, 4 Pack 677-T (SRS)

Summary: Even among fully trained and qualified individuals, differences exist in terms of hands-on experience, and the recognition that tools or techniques should be adjusted to deal with evolving conditions. Employees and supervisors should be alert to conditions under which modifications in equipment or technique are needed to ensure that desired results are achieved.

Best Practice - Positive Lessons Learned: As the top of an enclosed structure such as a tank is neared, lower-volume nozzles and extra caution should be used to compensate for lack of visibility, which can lead to uneven application of foam and unwanted exothermic reaction. As a good practice, free liquids in tanks should be sampled and an informed engineering judgment should be made regarding how to deal with them before proceeding with foaming operations. Also, as a good practice, the Procurement Buyer should be notified on occurrences when subcontractors are involved.

23. **Title:** Worker Injured By Falling Overhead Pipe During Demolition Work

Summary: During overhead pipe removal activities, workers failed to adequately analyze hazards of cutting overhead piping and to properly secure all portions of the cut pipe. When doing work in the overhead, the job must be planned and conducted to prevent loose

items from falling. Access to the area must be closely controlled to keep people out of harm's way.

24. **Title:** Personnel Contamination Monitors (PCM) Inadvertently Deactivated
Summary: - Extreme care should be taken when performing maintenance on PCM2 to ensure detectors are not inadvertently deactivated. - Eberline PCM2 monitors will appear to function normally when any or all detectors are deactivated.

25. **Title:** Use of Bullard PA20 Series PAPR at the INEEL
Summary: When choosing what respiratory protection to be worn in a work area, carefully inspect the unit's design to ensure that it is adequate to both perform the functions required by the job/task and will work reliably in the environment/area in which the work will be performed. Mechanisms on units, such as switches and plugs, must be checked to ensure that they cannot be deactivated, dislodged, or unlocked during the normal work activities. Consideration must be given to the general work area conditions. Certain types of work areas, such as high-congestion areas, may preclude the use of the Bullard PA20 Series PAPR because its charge port plug and on/off switch could be inadvertently contacted, thus causing its blower unit to stop working.

26. **Title:** Employee Fall Due to Platform Failure Resulting in a Near Miss
Summary: Interior permanent building platforms in aged buildings should not be relied on to support workers without appropriate inspection. A worker fell approximately four feet when a metal platform that he stepped onto while performing asbestos abatement activities gave way.

27. **Title:** Unauthorized Tampering with the RCAAS Detector Module Fuses During a Decontamination and Decommissioning Walkdown.
Summary: Personnel must adhere to their defined scope of work and established procedures. Working outside the established scope of work, procedures, and administrative controls may introduce potentially serious hazards to personnel and facilities.

28. **Title:** Building 776/777 Gas Venting Incident
Summary: A chemist failed to follow established conduct of operations and work control processes when venting gas cylinders into lab and building ventilation system causing individuals to become ill from released chemical gases.

29. **Title:** Low-Level Waste (LLW) Storage Activities Outside the Authorization Basis
Summary: Facility safety programs should implement controls that ensure any operations in and around a facility that may effect the safety basis for a facility are evaluated prior issuing the document or making follow-on changes. These controls may include implementation of a procedure that describes the roles and responsibilities for those

responsible for facilities to initiate evaluations (USQDs or pre-screening hazard analysis) prior to changes being made. If changes are discovered that have not been evaluated, a USQD or pre-screening hazard analysis should be initiated immediately.

30. **Title:** Pipe Cutting Tool Failure - UPDATE

Summary: 1. Adherence to manufacturer's safety precautions is particularly important when operating tools or equipment that contain highly energetic systems (e.g. hydraulics, high-speed rotating components, heat-producing components, and high voltage systems). (ISMS CF-C, Identify and Analyze the Hazards, CF-5 Perform Work Within Controls, GP-E, Identification of Safety Standards and Requirements and GP-F Hazard Controls Tailored to Work Being Performed).

2. Expect the unexpected. Equipment that operates as designed, when appropriate safety precautions are invoked, should be safe. However, if a highly energetic tool or piece of equipment fails the result has the potential to be extremely dangerous. Be aware of the axis through which energy is applied and then stay clear and out of the "line of fire." Insure that observers wear appropriate personnel protective equipment, observe required safety precautions and that they are not exposed to potential danger if there is an unplanned failure. (ISMS CF-A - Establish ES&H Policy, CF-C Identify and Analyze the Hazards, GP-E Identification of Safety Standards and Requirements and GP-F Hazard Controls Tailored to Work Being Performed).

31. **Title:** Pipe Cutting Tool Failure

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32. **Title:** Pyrophoric Reaction During Glovebox Size Reduction
Summary: Personnel working with processes involving pyrophoric metals must fully understand the potential reactions. Hazards that could cause or contribute to the severity of a combustible metal fire should be identified by a hazard analysis, and measures to minimize the hazards should be implemented. This event illustrates the importance of the Integrated Safety Management Program. The extensive pre-planning by the D&D team prepared the work force for the worst case scenario. All personnel responded appropriately to this incident.

33. **Title:** Proper Selection of Personnel Protection Equipment (PPE)
Summary: Whenever installing/using new controls to correct new or additional hazards, these controls must also be analyzed to determine if they (1) continue to control the original hazard or (2) themselves introduce new hazards. All PPE used should be examined for both effectiveness and durability prior to use. In this case instituting controls to minimize one hazards failed to control the initial hazard.

34. **Title:** Vigilance in New or Infrequent High-Hazard Operations
Summary: This Bulletin provides information about several serious events caused by a lack of vigilance and attentiveness on the part of those involved in conducting first-time or infrequently performed high-hazard activities. Failure to identify the hazards, develop appropriate actions, and remain alert to the possible dangers involved in such activities could lead to potentially catastrophic outcomes at DOE sites.

Click on the following link to obtain a copy of the original ES&H Bulletin 2005-09

2005-09.pdf (You must have Adobe Acrobat Reader(r) to view this file.)

35. **Title:** Effects of Hoisting and Rigging Activities on Equipment Important to Safety, Potential Inadequacy of the Safety Analysis (PISA)
Summary: When performing deactivation, demolition, and construction activities ensure Unreviewed Safety Question Determinations (USQDs) adequately address risks that may be encountered related to equipment important to safety.

36. **Title:** Suspect/Counterfeit Bolts Discovered in Drum Lid (Drum Web) Restraining Devices
Summary: Suspect/counterfeit bolts need to be identified, controlled, and dispositioned. When suspect counterfeit bolts are identified, an occurrence report needs to be issued in accordance with DOE requirements.

37. **Title:** Inadequate Liquid Low-Level Radioactive Waste (LLLRW) Solidification Process
Summary: When developing and implementing new processes or innovative treatment technologies proper planning, hazard reviews, and

controls must be implemented to ensure risks, hazards, and activities associated with new processes are properly identified and controlled.

Waste generators that intend to or are already solidifying aqueous waste streams for disposal should insure that they have a full understanding of the liquid waste to be solidified, and that the proposed or in use packaging system is approved for the intended solidification operation.

38. **Title:** SRS Pipe Rack Structural Failures - Potential For Significant Injury Exists (SRS)

Summary: Recently at the Savannah River Site (SRS), two incidents occurred involving pipe rack structural failures.

- On 12/21/04, Construction experienced a significant structural failure with one of its pipe racks, in which the entire pipe rack collapsed.

- On 01/10/05, one of the Material Acquisition Centers (MAC) also experienced a structural failure in a pipe rack arm.

With a large number of pipe racks located across the Site, there is a potential for personal injury if work is occurring around these older pipe racks.

39. **Title:** Unauthorized Movement of Energized Surface Laid Cable at U1g

Summary: A laborer was exposed to the risk of electrical shock when he lifted energized surface laid cables with his hands, contrary to the Surface Laid Cable (SLC) policy promulgated by a BN Company Bulletin. The event was critiqued and discussed with all U1g complex personnel. Actions to be taken include stressing "STOP WORK" in the event of unexpected conditions or response, proceduralizing the requirements of the Company Bulletin, and developing work package(s) for back-filling operations.

40. **Title:** Protective System Protects Workers during Trench Cave-in

Summary: Workers were connecting two sections of newly installed 9-way duct bank in a protected section of trench when a cave-in occurred in an adjacent, unprotected, section of the trench. The protective system was a hydraulic Waler system with 4x8 sections of plywood.

NOTE: a protective system is a means to (1) maintain stability, (2) avoid collapse, and (3) create a secure environment in case of an excavation failure. If the excavation is greater than 5 feet a protective systems must be used. Protective systems are: sloping, shoring, and shielding.

41. **Title:** Unmonitored Dose To Subcontractor Workers at Building 714-N
Summary: This event underscores the importance of conducting thorough evaluation of process changes and preparations that could potentially have adverse impact to personnel safety.

It is also important that personnel fully understand radiological control requirements to ensure areas of concern are properly controlled for the protection of individuals (e.g., non-radiological workers, members of the public, etc.) from radiation and/or radioactive material hazards.

Personnel must recognize and consider all factors during the work planning process to address areas of concern and to avoid increased risk to others prior to the execution and completion of work.

42. **Title:** DOE Complex Ladder Injury Incidents
Summary: Ladder injuries continue to occur at sites across the DOE Complex. It is imperative that proper safety measures (procedures, training, disciplined operations, questioning attitude) are followed to prevent such ladder events at SRS.

43. **Title:** Eberline HandECount Software Glitch
Summary: All users of the Eberline HandECount Program should be alerted that a weakness in the software exists that, unless users take specific actions, can result in False Positives and False Negatives.

44. **Title:** Worker Splashed With Nitric Acid
Summary: It is imperative to have the right equipment for the job. In this case the adaptor attached to the dispenser was not compatible with the acid bottle - lack of sufficient thread engagement. In advance of the need, obtain correct dispensing adaptor for the acid bottle. Additionally, configuration of the work needs to be reviewed. The selected receiving container was taller than the staged acid dispensing configuration and unnecessary movement of the 2-liter nitric acid bottle within the fume hood occurred. Operations should be setup so acid bottles used for dispensing are stationary during lab work. Finally, it is important to wear all of the required PPE, even for quick jobs. Laboratory coat, smock, uniform, or other protective clothing should be worn as required. Additional direction was given to add long gauntlet gloves and acid apron when dispensing acids within fume hoods until other methods are approved. Proper reaction can prevent further or serious injury.

45. **Title:** Line-Of-Sight Obstructions Can Result in Accidents and Injuries (SRS)
Summary: Maintaining line-of-sight and communicating effectively are key factors in performing jobs safely. This is particularly important for D&D workers when working around walls, dry wall, and obstructions.

Extreme care must be taken when workers are separated on

opposite sides of walls, line-of-sight obstructions, etc., and are coordinating tasks such as drilling or cutting conduit, supporting or holding sections of pipe to be cut, or tracing wires through walls.

46. **Title:** Contact with Underground 13,800 Volt Electrical Cable by Subcontract Drilling Operations

Summary: Assumption that a utility scan was completed and deviation from documented work order planning procedures can result in serious consequences.

47. **Title:** Inattention During Crane Operation Causes Operator Injury

Summary: In facilities where overhead and gantry crane or hoist operations may be ongoing, all personnel should attend to remaining clear of the possible load path, as well as the path of the crane structure. Gantry cranes travel along a rail path at floor level and present additional hazards to personnel.

Cranes, hoists, and other lifting devices used within facilities have the potential to cause serious injury and equipment damage. Crane operators have the primary responsibility for ensuring that the load or travel path of the crane does not pose a hazard to personnel and equipment.

Crane operators need to ensure that they are positioned in a location that allows an adequate line of sight prior to initiating the lift and throughout crane movement. If the crane operator cannot visually observe the load or crane travel path, the operation should be stopped. Prior to resuming crane operations, additional personnel should be designated as signal persons to relay directional signals to the crane operator and ensure that crane movement does not endanger other personnel or equipment.

All personnel should be continuously aware of surrounding and/or changing conditions in the workplace that may present hazards, which could result in personal injury or equipment damage. If unexpected situations arise, the activity in progress must be stopped and steps taken to warn others of potential hazards immediately.

48. **Title:** Degraded Freeze Protection Leads to Chilled Water Tube Ruptures

Summary: Inadequate freeze protection on HVAC systems can lead to line freezing and water release which, in turn, can cause significant damage and disruption of operations. This potential effect warrants extra diligence on field verification of the adequacy and condition of the freeze protection provisions.

49. **Title:** Demonstration Displays Using Interactive Technologies

Summary: Public displays should be appropriately evaluated to identify all possible operations hazards.

50. **Title:** Degradation and Failure of Stored Radiological Material Containers and Packages

Summary: Recent events demonstrate that long-term storage of radioactive material containers and packages continue to pose hazards. Corrosion and other degradation of radioactive material packages and their contents, in combination with the buildup of pressurized flammable gases from radiolysis and decomposition, can create the potential for accidents unless such conditions are considered in design and maintenance, and for the actual storage lives of the packages.

51. **Title:** Aerosol Lubricants Can Flash if Sprayed on Energized Shredders

Summary: Aerosol shredder lubricants that contain extremely flammable propellants are no longer manufactured and should be removed from stores for proper disposal to prevent their use on energized shredders. Lubricants such as silicone spray may contain liquefied petroleum gas, an extremely flammable propellant that can flash if sprayed on energized paper shredders or any other energized electrical equipment. You should read the label and review the product Material Safety Data Sheet (MSDS) before using any product to ensure it is safe and appropriate for use, and you should never use the product if you are unable to use the product in the prescribed manner or in association with required equipment. A Los Alamos National Laboratory technician received a minor burn on his left forearm October 15, 2003 when he sprayed an aerosol lubricant on a sheet of paper to lubricate an energized shredder. The material flashed, blew the top off the shredder cabinet, and started a small fire that the technician was able to extinguish with a Halon extinguisher. The shredder had been obtained from the excess property yard without an operator's manual, and an MSDS for the lubricant was not on hand. The shredder was removed from service and the remaining stock of the shredder lubricant was discarded. The process for retrieval of office equipment from the excess salvage yard was reviewed and will be revised to include electrical inspection of office equipment by technically qualified personnel to ensure the safety and operability of the equipment before it is re-issued.

52. **Title:** Hood Ignition During Plasma Arc Cutting

Summary: Flame resistant fabric does not appear to be adequate to protect workers in an environment where extreme localized heat is combined with a significant flow of fresh air.

53. **Title:** Personal Radiation Detection Instrumentation (PRDI) requirements

Summary: Adequate pre-job planning should include consideration of the proper use and control of PRDIs in areas where CAAS audibility concerns exist.

54. **Title:** Tank of Hydrochloric Acid Ruptures

Summary: A 110-gallon carbon steel tank containing 457 pounds of hydrochloric acid experienced a catastrophic failure and its

contents were sprayed in a 50-foot radius from the tank before the tank base ripped away and landed 125 feet from the point of origin. Personnel did not recognize that holding the hydrochloric acid in the carbon steel tank more than four days was a change in conditions that required the return of the hydrochloric acid to the polyethylene storage container to avoid creating a potential hazard. Holdpoints will be initiated to ensure the safety margin is adequate for the work performed.

55. **Title:** Management Concern at New Hydrofracture Facility (NHF) Building

Summary: When planning decontamination and decommissioning (D&D) activities that involve the draining of fluids from equipment (i.e., heat exchanger/drying units, etc.), projects should ensure proper planning is done by the subcontractor. Planning should include a contingency plan in the project Activity Hazard Assessment (AHA) that covers fluid spills. Provisions must be included for proper containerization of the equipment fluids during D&D operations.

56. **Title:** Dust Explosion Kills Six, Injures Dozens, and Destroys Pharmaceutical Factory

Summary: On January 29, 2003, fine plastic powder used in manufacturing rubber products exploded at West Pharmaceutical Services, Kinston, NC, killing six workers and injuring dozens more. Dust had accumulated above a false ceiling unbeknownst to plant personnel.

57. **Title:** Sulfur Dioxide Inhalation Following UPS Battery Failure

Summary: A battery on an uninterruptible power supply (UPS) failed, releasing sulfur dioxide into the work environment. One person suffered nausea from exposure to the fumes and two others reported minor effects.

Prior to taking a system out of service for long-term maintenance or modification, preventive maintenance procedures should be reviewed to determine if any need to be continued during the out-of-service period. This is particularly important for partial deactivation of a system.

58. **Title:** Crane Inspections and Lift Plans

Summary: For critical lifts and lifts involving high hazard radioactive materials, DOE contractors should not just meet minimum OSHA standards, but should also achieve the level of safety provided by the recommended practices contained in the "Crane Handbook" and in the DOE Hoisting and Rigging Manual.

59. **Title:** Foreign Manufactured Rigging Equipment Used On-Site

Summary: Ensure that vendors are supplying wire rope made in the United States in accordance with the Wire Rope Technical Board [WRTB] or the Associated Wire Rope Fabricators [AWRF](except stainless steel, and unless recommended otherwise by a crane or hoist

manufacturer) and provide a Certificate of Compliance from the manufacturer traceable to the material furnished and signed by the supplier's authorized representative.

60. **Title:** Spurious Alarms on Continuous Air Monitors

Summary: Spurious alarms on the continuous air monitors (CAMs) of the exhaust stacks for two ventilation exhausters at Hanford were likely due to defective high voltage cable connectors. A contributing factor may also be deficient grounding of the detector cabinets and/or neutral wiring on the exhauster skids.

61. **Title:** Lessons Learned during Readiness Assessments for the Restart of the Wet Chemistry Operations

Summary: Complete preparation for implementing and operating software is important to successful performance of an operation. This includes ensuring training requirements and personnel requiring training are identified, training is scheduled and performed and attendance documented.

62. **Title:** Laborer's Personal Protective Equipment (PPE) Burned Below Mid-Shin on Right Leg While Cutting Rebar With a Portable Abrasive Disc Circular Saw

Summary: Hotwork is any work involving burning, welding, cutting, or similar operations that is capable of initiating fires or explosions. The use of abrasive cutting saws (Chop Saws) can generate a large quantity of hot sparks that must be controlled.

63. **Title:** Operation of Crated Waste Assay Monitor Prior to Door Closure Interlocks

Summary: disabled due to lack of post maintenance testing.

64. **Title:** Site Contamination Due to HEPA Filter Changeout

Summary: When performing HEPA filter changeouts, the hazard analysis should consider environmental protection as well as worker protection. This is especially important for old and deactivated facilities.

65. **Title:** Watch Out for Sharp Edges in Metal Lockers and Cabinets

Summary: Personnel need to be aware of potentially sharp edges in the work area.

66. **Title:** Uninterruptible Power Supplies (UPS's) and Diesel Generators Can Fail When They Are Needed Most, and Simultaneous Failure of Both Will Mislead and Delay Troubleshooting Efforts

Summary: 1. It is not enough to purchase a large UPS unit; a plan must also be adopted to continuously replace its batteries as they age.

2. A vendor's user manual may not contain all the relevant information about proper configuration and age considerations of UPS batteries.

3. When a generator is out of sight and hearing range, a means must be provided to immediately indicate when it is no longer producing power.

4. Large battery-operated lights or generator lights should be made available in case unexpected troubleshooting activities may need to take place in a darkened facility.

67. **Title:** Contamination of Workers with 241Am during Dismantling of Glove-boxes in the Czech Republic

Summary: • After any hazardous operation with open sources it is necessary to control daily the personal clothing and protective aids, including respirators and change them as frequent as appropriate – the obligation to use such personal protection during hazardous operation is self-evident.

• Very important input data on calculation of a possible release of radioactive material at the workplace could be obtained from the activity measurements of the filters of ventilation system, together with the record of ventilation rate and precise intervals of collecting period. The results must be available before the next task at the workplace is started.

• Contamination of the body surface may considerably interfere with the in vivo measurements of alpha emitters. The sensitivity of a portable alpha monitor may be to low to detect any activity which is later ascertained with a long term whole body measurement in shielded conditions. In this respect the role for early onset of collecting stool and urine in suspected subjects could not be overlooked, as well as the preparedness to apply express methods which are able to differentiate surface and internal contamination in event involved workers.

68. **Title:** Potential Near-Miss Hoisting/Rigging Load Cell Separation at Building 9204-2E

Summary: Hooks with threaded connections can disengage from lifting fixtures.

69. **Title:** Worker and Rescuer Fall Through Ceiling

Summary: Fully integrate safety to include subcontractors including procurement documents, planning document, and monitoring of the work performed to ensure that Integrated Safety Management (ISM) requirements are met.

70. **Title:** Employee Contamination

Summary: Employee became contaminated after improperly doffing Personal Protection Equipment (PPE) while in a radiological contamination area.

71. **Title:** Subcontractor Injured During In-Situ Grouting Accident - Reissued
Summary: M&O contractors must ensure that they have

1) adequate subcontractor procurement requirements in place,

2) procedures requiring appropriate management oversight of the subcontractor's policies, work control processes and field personnel, and

3) Provided subcontractors with lessons learned information specific to the work they are contracted to perform.

Subcontractors must be required demonstrate to the satisfaction of the contractor that their equipment and repair process is adequate to properly address past problems they have encountered with the equipment they will use at the site and to forward any lessons learned information gained as a result of their on-site work prior to leaving the site.

72. **Title:** Air Lines Freeze Up
Summary: Ensure the individuals wearing the respirators continue to receive sufficient clean breathing air during cold weather as air feed systems for respirators may experience a frost buildup and need thawing.

73. **Title:** Cut 110 Volt Wire
Summary: When performing electrical maintenance activities, be aware of unmarked circuits and unidentified wires even after all known power feeds have been disconnected and locked out and voltage checks performed. Expect the unexpected. Always treat wiring and equipment as if it is energized until you prove there is no electricity present. Individually verify that every wire is de-energized before cutting by using a contact and proximity type voltage measuring devices. Wear the same personnel protective equipment (PPE) you would wear for energized work; such as, insulated tools, insulated gloves and, if possible, use a rubber mat.

74. **Title:** UT-Battelle Contractor Employee Receives Serious Burn Injury from Hot Water Accidentally Discharged from Tunnel Washer
Summary: Potential hazards should be appropriately identified and controlled through the creation and implementation of physical and administrative barriers to help mitigate accidents. Job hazard analysis needs to be carefully reviewed to ensure a proper level of detail has been considered and documented.

75. **Title:** Use of Supplied Breathing Air Equipment
Summary: Respiratory protection equipment may only be used in the configuration tested and certified by the National Institute of Occupational Safety and Health (NIOSH).

76. **Title:** Lockout/Tagout of Heat Trace

Summary: First, practical design considerations for heat trace systems can place insulation over the heat trace. The heat trace tape may often cover several feet of piping and equipment. Consequently, the wires providing the energy to the heat trace are usually not visible for most of the equipment when the insulation is in place. Therefore, pre-job planning walkdowns may not identify the need to de-energize and lockout/tagout the heat trace. Other means of ensuring the heat trace such as administrative controls should be considered.

Second, job hazard analysis needs to be carefully reviewed to ensure a proper level of detail has been considered and documented. This will help ensure all hazards have been considered and all mitigation actions for the hazards have been defined in sufficient detail to provide confidence the actions are not overlooked.

77. **Title:** Improper Use of Portable Power Tool Results in Recordable Injury

Summary: The manufacturer's operating manual for certain specialized portable power tools can contain operating instructions/restrictions that even the veteran craft person may not be aware of. These instructions/restrictions must be made available to those workers who use the equipment.

78. **Title:** Lockout/Tagout Procedure Violated

Summary: Lockout/Tagout needs to be performed as early as possible in the sequence of work. Established procedures must be followed to mitigate the hazard even if the worker does not perceive the hazard as justifying the effort needed to mitigate it. When replacing faulty or suspect components, the replaced item should be marked or otherwise segregated from new items to avoid reuse of the faulty or suspect item.

79. **Title:** Active Air Line Cracked by a Trackhoe during Demolition of K-1301

Summary: The proximity of adjacent equipment, processes, and structures must be fully understood and addressed prior to demolition activities.

80. **Title:** Mucker Rolled During Mining Operations

Summary: Communicate hazards and specify preparatory activities that can mitigate unsafe conditions. Create and maintain safe operating surfaces.

81. **Title:** Electrical Short in a 120/240 volt flat conductor cable results in the Smoldering of Floor Carpet Tiles

Summary: Verify the operational integrity of aged under carpet electrical systems and equipment and report deficiencies to responsible personnel.

82. **Title:** Waste Hauling Container Incident

Summary: Inspect the interior of the containers and verify that no water is present prior to lining a container. If a lined container is found to be leaking, the excavator should place a bucket of material into the lined container prior to dumping. This will allow the mass of the material to pull the liner out when dumping.

The mass of the liner is not sufficient to prevent it spilling out with the water as it is dumped from a container. Liners should be secured prior to disposing of the water.

The operators of the equipment (shuttle truck and excavator) should stop and discuss their plans prior to attempting to remove the liner from the container. In addition, containers must be properly lined up to the excavator when the liner removal is attempted.

Personnel should be periodically reminded of the importance of not becoming complacent while performing repetitive or routine tasks.

83. **Title:** Radioactive Contamination Discovered in Vehicles Used by Subcontractor on DOE Site

Summary: Radiological controls and frisking practices at sites containing legacy contamination and high background radiation levels should be carefully evaluated to ensure contamination is not spread off site.

84. **Title:** Identification of Required Precautions Associated with Water Reactive Metals

Summary: Consideration should be given to the consensus standard requirements for handling and storage of water reactive materials, including calcium and lithium. The implementation of these requirements should be established and documented accordingly.

85. **Title:** Bridge Crane Hoist Hook and Cable Release Near Miss

Summary: The use of operational equipment for construction purposes can result in potential personnel and/or equipment damage if operating limits are not reviewed and determined to be adequate for the intended use.

86. **Title:** Miswired Plug on Rented Elevating Work Platform Creates Electrical Hazard

Summary: Rental equipment may not meet its design specifications when received because of prior renter misuse or inadequate maintenance by the owner. It should be thoroughly inspected and test operated to ensure safety and functionality before being used on Site.

87. **Title:** Oven Temperature Controls- Setpoint or Shutdown?

Summary: After discovering that an oven had overheated and destroyed an environmental experiment, personnel determined that the oven controller they thought functioned as an overtemperature cut off

actually was programmed as a high temperature setpoint. Because personnel failed to adequately identify potential hazards associated with oven operation such as setpoint malfunction, extremely high temperatures, power interruptions, or potential byproducts created during thermal excursions, no mitigating controls were in place. Personnel are now required to read the oven manual, a new hazard analysis was completed, and an overtemperature setpoint and shutoff was established.

88. **Title:** Release of Water from Spent Nuclear Fuel Containers Retrieved from Below-grade Storage Facilities

Summary: Containers of spent nuclear fuel that have been stored in below-grade storage facilities for an extended period have the potential for containing water. Water may be present in the container even if there are no obvious external indications that the container has been in contact with water. Handling and transportation of a container can cause the water to be released unexpectedly. Equipment can be integrated into the shielded carrier used to transfer these containers in order to contain the water within the carrier.

89. **Title:** Burn Injury Sustained During Welding Operation

Summary: Although welder safety training and welding procedures normally include prohibitions against allowing combustible/flammable material near welding operations, they may not specifically address the issue of flammable residue from cleaning solvents or oils. The introduction of combustible/flammable materials during cleaning activities was overlooked in this incident, resulting in personal injury to an experienced welder. The Laboratory has updated their site-wide welder training to address residue hazards.

90. **Title:** Drill Pipe Falls

Summary: Connecting threads on drill pipe and assemblies should be inspected periodically for wear. Additionally, care should be taken not to over loosen connections.

91. **Title:** Barber Rig Cleanout Bailer Near Miss

Summary: Proper hoisting and lifting techniques should be reviewed before all hoisting and rigging activities. Activity Hazard Analyses should be prepared for any new task so that potential hazards and unique working conditions can be recognized and discussed. Special attention must be given to loads that may shift during hoisting and lifting operations.

92. **Title:** Hazardous Spill Clean-up Results in Bulging Drum Incident

Summary: Employees must expect the unexpected and consider cause and effect situations during hazardous spill clean-up actions. Placing a composition of rock, limestone base and high pH soil contaminated with sulfuric acid into a sealed drum may allow sufficient chemical reaction to cause excessive internal drum pressure. This pressure may then cause the drum to bulge and to become an even more

dangerous hazard to abate. Employees must also be aware that the rate of venting from the bulging drum may not be sufficient enough to overcome the increasing internal drum pressure being generated by the continuing chemical reaction.

93. **Title:** Scaffolding Work Dislodged Contamination

Summary: Contamination beneath a walking surface can be knocked loose and made airborne by banging on the floor with heavy objects.

Unusual work activities in a normally benign environment can produce unexpected hazards. Planners should specify precautions to prevent unnecessary worker exposure.

94. **Title:** Electrical Shock

Summary: Management must ensure all wiring in a work area is identified and de-energized prior to initiating work activities. A thorough review, inspection, and walkdown to verify the conditions of the work area during the planning of an activity can significantly reduce the possibility for electrical shock.

95. **Title:** Violation of Radiation Work Permit (RWP)

Summary: Each time a person is to enter an area to perform work covered by a RWP, the person should read each requirement of the applicable permit and ensure they are meeting those requirements. Attention must be paid to each requirement, and a check must be made to ensure each requirement is met prior to entering the area and performing work. Included in these requirements are requirements for appropriate dosimetry and personal protective equipment. By paying attention to these requirements, one may be reminded that the dosimetry they are wearing is not the dosimetry required by the RWP and that another type of dosimetry must be obtained prior to entering the work area.

96. **Title:** Internal Contamination Hazards of Alpha Emitting Isotopes

Summary: The hazards involving curium-244 and other similarly hazardous transuranic and alpha emitting isotopes must be clearly understood, evaluated, and communicated to all personnel working on tasks where these isotopes are present. The potential for a serious personnel exposure must be considered during all phases of job planning. Small amounts of transuranics can impart high internal doses; therefore, attention to detail must be elevated and personnel should adopt a cautious attitude when working with these materials.

Hazards analysis and work planning documents must contain adequate detail to ensure that tasks are properly executed. These documents should be revised to reflect changes in methodology or conditions and to ensure that new hazards introduced or identified are adequately controlled.

97. **Title:** Unintended Electrical Pathway Causes Anomalous CAM Condition
Summary: Over time the riveted feet on the Canberra alpha continuous air monitor (CAM) 1700 can work loose, allowing the rivets to contact the circuit board inside the CAM and causing anomalous behavior. Spacers installed on the bottom of the monitor chassis and attached to the circuit board stand-off can prevent inadvertent contact between the rivets and the circuit boards.

98. **Title:** Improperly Installed Amphenol Electrical Connectors
Summary: This Lessons Learned is issued in order to highlight 8-pin amphenol (AN-3057-15) and 4-pin amphenol (E9542) threaded electrical connector installation and application errors that could lead to electrical shock.

99. **Title:** ISMS Phase I Verification
Summary: The lessons below were learned during the October 1999 DOE Phase I Verification of the Fluor Daniel Hanford (FDH) Integrated Safety Management System (ISMS). They are grouped along with their discussions and analyses under topical headings, which are preceded by ***

100. **Title:** Stemming the Influx of Counterfeit/Suspect Parts
Summary: Ordering non-graded fasteners can result in receipt of counterfeit or suspect parts. Some vendors include suspect/counterfeit fasteners in shipments of non-graded fasteners to satisfy requested quantities. Customer supplied items in fabrication projects often contain suspect/counterfeit components.

101. **Title:** Laboratory Energy-producing Device Hazards and Emergency Response Preparedness
Summary: Energy-producing devices (e.g., hotplates, soldering guns) should be disconnected and/or stored when not in use. · Lab Owners and operators need to maintain awareness at all times. Give your space the once-over every time you enter or leave. · Emergency-response personnel need direct assistance from qualified staff during reentry to large, complex facilities such as ECF. · Provisions for blocking doors open to run fire hose should be made to avoid hose crimping during emergency response.

102. **Title:** Automated Transient Combustible Inspection
Summary: The time required to conduct frequently performed inspections such as transient combustible inspections may be significantly reduced and the accuracy of the information collected during inspections may be improved by automating inspection forms on portable, hand-held computers.

103. **Title:** Does Your Site Have an Inspection Program for Outdoor Signs, Labels, and Tags?
Summary: Outdoor signs, labels, and tags must be inspected regularly to identify damaged or weathered signs, labels, and tags that need to be replaced. Providing personnel with new signs and equipment to

replace signs during inspections helps ensure that weathered or damaged signs, labels, and tags are promptly replaced. Personnel should also be instructed to attach signs, labels, and tags using all provided attachment points to prevent excessive wear or abrasion damage.

104. **Title:** Electrical Shock Due to Broken Receptacle
Summary: Personnel access to equipment is an important design consideration. In the case of the receptacle involved in this incident, access was made difficult by installation of ductwork in front of it. This made proper orientation of the plug to the receptacle difficult at best. It's not know why the receptacle was not relocated. Perhaps it was thought that with two others located close by, it wouldn't be used. But, as learned in this incident, if its there, chances are good that someone will eventually use it, regardless of the difficulty. Receptacles should be relocated when building modifications restrict access.

105. **Title:** Safety Videos Created for Protective Force
Summary: Short video presentations are an effective communication tool for field personnel working 24 hour a day, seven day a week schedules that do not coincide with other types of regular safety briefings. Video reenactments of adverse safety events may also enhance employees' retention of safety information.

106. **Title:** Near-Miss Potential for Exposure to Sludge Vapors
Summary: Procedure requirements for work planning and control, that assure health and safety professionals designate appropriate personal protective equipment (PPE), must be followed to ensure personnel performing the work are protected from identified hazards.

107. **Title:** Trailer Ramp Incident : ALO-AO-MHSM-PANTEX-1999-0001
Summary: Equipment used and designed for a specific job should not be modified unless appropriate evaluation and authorization is granted. Technicians involved in the design application of the approved engineering modification should not alter the planned and designated application in the field of work being performed without expressed and documented authorization. CONCLUSION: The lessons learned in the event can be applied to all industrial operations at Pantex plant. The altering of equipment design is unacceptable unless the appropriate reviews take place.

108. **Title:** Near Miss Involving Compromise of Barrier Designed to Protect Workers
Summary: Procedure requirements designed to disposition radiological contaminated waste must be adhered to so workers and the environment are protected.

109. **Title:** Familiar Activities May Present New Hazards When the Scale or Speed of Work Changes
Summary: When operations are undertaken that involve performing an

unusually large number of routine activities in an accelerated time frame, previous safety reviews may be inadequate to identify and control the hazards associated with the larger-scale and/or rapid operations. Treating the familiar but potentially more hazardous operations as new activities ensures that comprehensive safety reviews are completed, new hazards are identified, and adequate controls are developed.

110. **Title:** Importance of PPE and Reporting/Receiving Proper Medical Attention for Injuries

Summary: When handling sharp tools, employees must take extra care and wear appropriate personal protective equipment. If injuries occur, even minor injuries, it is important to report and receive medical attention immediately in order to prevent infection, hospitalization, and/or possibly surgery.

111. **Title:** Removal of abandoned piping results in workers contacting a caustic solution

Summary: Proper job planning depends on thorough identification of hazards and subsequent Job Hazard Analysis. A limited job scope, detailed job description, including unknowns and assumptions, will focus the hazard review and mitigate the potential for hazards to go unidentified.

112. **Title:** Near-Miss Involving Fallen Light Fixture and Ceiling Tiles

Summary: Contractors need to thoroughly evaluate work related to fastening light fixtures to ceilings to ensure that maintenance personnel follow all applicable codes and good work practices.

113. **Title:** Operator Sprayed with Sulfuric Acid

Summary: An operator at the Advanced Test Reactor (ATR), Idaho National Engineering and Environmental Laboratory (INEEL) was sprayed with a foam-like sulfuric acid spray while disconnecting an airline hose to an air sparge line of an 8000 gallon bulk acid storage tank. The employee was not wearing personal protective equipment.

114. **Title:** Old Cylinder Identification and Deposit

Summary: Old cylinders that are not being used should be identified and disposed of before a leak occurs. Eventually, seals and gaskets will fail causing unwanted release of the gases. In some situations, cylinders in good condition can be returned to the vendor.

115. **Title:** Stop Work Order Issued for Repeated Fall Protection Violations

Summary: Employees must ensure that fall protection requirements are followed.

116. **Title:** U1A Electric Shock - High Potential Near-Miss Incident at the Nevada Test Site U1A Complex

Summary: Identification and isolation of electrical sources should be part of lock out/tag out whenever the potential for inadvertent contact exists.

117. **Title:** Ironworker Injured in Rigging Accident

Summary: Personnel involved in hoisting and rigging operations should not stand between the load being lifted and another object. Only after the load is safely landed and determined to be stable should workers approach the load.

Serious injuries can occur when routine safety practices are overlooked and when personnel perform jobs for which they are not properly trained.

118. **Title:** Refrigeration Failure Can Affect Chemical Stability

Summary: A normally stable compound may become unstable at elevated temperatures. Cold room users should recognize that certain equipment failures may heat the cold room to temperatures above room ambient. Any over temperature indication must be reported to a responsible supervisor immediately.

119. **Title:** Electrical Safety Success Story at Y-12

Summary: When hazards are recognized and work is stopped, potential accidents, which could result in human injury or fatality, likely equipment damage, and/or expensive work interruptions, are avoided.

120. **Title:** Air Compressor Deflagrations During Start-Up

Summary: Lessons Specific to the Style of Air Compressor: Change air-oil separators on the compressors based on time, differential pressure, or return oil flow. Exceeding any one of the three limits requires immediately changing the air/oil separator. Pre-fill oil filters and the compressor with oil. If hoses are changed, then pre-fill the hoses also. This reduces the time to full lubrication flow. Bump-starting this type of compressor to fill the oil system is not recommended. The typical duration of a bump-start may not be long enough to assure the oil system is completely filled. Provide a means to start and shutdown rotary screw compressors unloaded. This provides a significant margin to combustion. Lessons on General Maintenance Practices: Ensure a long-term maintenance plan is in place, including major maintenance periods which may occur at five- or ten-year intervals. Such a major maintenance period should include checking the operation of the inlet and minimum-pressure valves and conditions of the hoses. Use oil-analysis test results rather than run time as the criteria for changing the oil. The test results provide early warning of wear inside the compressors. Operating costs will be reduced because of the smaller amount of oil, less time spent changing the oil, and less used oil going to disposal. A service- or manufacturer-representative visit at infrequent intervals is worthwhile. This enables the representatives to provide up-to-date information and recommendations to improve maintenance and operation that will further extend the life of the equipment. While extensive in-house technical knowledge can be maintained, keeping general, broadly based expertise on staff and relying on the service and

manufacturer representatives to provide specific technical expertise may be more cost-effective. Both the manufacturer's and service representatives can have knowledge of the equipment that is not included in the owner's manual. These representatives typically have the experience of dealing with many machines over several years. Comprehensive knowledge of the theory of operation is important to making good decisions about the maintenance and operation of equipment. Without this knowledge, faulty decisions are made. Examples of this were using only differential pressure to indicate the need to change the air-oil separator and the decision to perform multiple bump-starts on a compressor without recharging the oil in the compressor section.

121. **Title:** Steam Strainer Failure Leads to Injury
Summary: Materials stocked in maintenance shops for field use (bench stock) must be clearly identified to ensure they are not used in an incorrect application.

122. **Title:** Abandoned Wiring Shocks Worker
Summary: All wiring which appears to be abandoned should be considered energized until it can be verified that it is de-energized.

123. **Title:** Potential Shock Hazard from Eberline Radiacs
Summary: Personnel who work inside Eberline radiation instruments should exercise extra caution to avoid electrical shock. Only the appropriate electrical power cords should be used on Eberline instruments.

124. **Title:** Dry Ice Causes Drum Over-Pressurization
Summary: Closed or sealed containers, such as the 55-gallon Department of Transportation (DOT)-type 17C drum, should not be used for the disposal of Dry Ice (solidified carbon dioxide). Storing Dry Ice in a closed container will lead to a build-up in pressure, possibly resulting in an unexpected blow-off of the container lid or blow-out of the container walls. Summary: On November 7, 1995, the lid of a 55-gallon, 17C drum blew off, hitting the top of the fabric membrane structure in which it was housed. This was a consequence of the handling of a polychlorinated biphenyl (PCB) spill on the previous day.

125. **Title:** Communication May Prevent Accidents
Summary: Personnel performing operations on a system should have current, up-to-date information about the system condition and status and its effects upon their tasks. Otherwise, failure, malfunctions, etc. in one or more components of the system may have unintended, unpredictable consequences.

126. **Title:** Skin Contamination - Source Unknown
Summary: Many variables, such as perspiration, airflow, and static electricity can cause or contribute to unexpected contaminations while working in contaminated areas. To the greatest extent possible,

these variables need to be considered and discussed during pre-job briefs.

127. Title: CONDENSATION-INDUCED WATER HAMMER STRIKES AGAIN

Summary: Pressurized dead legs without functioning traps or periodic manual blowdowns must be assumed to have condensate present. The affected section of piping MUST be isolated, depressurized and drained before restoring steam to the system. Always check the operation of main line steam traps before initiating steam to a branch header. When a trap fails, condensate can build up in a system in a very short time. A condensation-induced water slug can form at very low condensate-flow conditions. "Cracking Open" valves in lines with condensate in them is NOT safe and can increase the severity of water hammer under some conditions. Winterization activities may result in abnormal system lineups that can lead to condensate in dead legs. Extra caution should be used when restoring systems to service to insure that no condensate is present in any portion of the piping.

128. Title: Hand Fracture from Check Valve Tipover

Summary: When the scope of an on-going job is increased to include the handling and/or movement of heavy components, work must stop and the job must be re-evaluated for potential hazards that may not have been considered in the original job hazard review process.

129. Title: Unsafe Power Strips Sold with Counterfeit UL Mark

Summary: Underwriters Laboratories Inc. (UL) has issued a warning that certain power strips and surge protectors manufactured in China may present a shock or fire hazard and do not comply with UL's Standards for Safety. These products have a counterfeit UL Mark on them or their packaging. Problem/Issue: UL's evaluation of certain market samples has revealed the following problems: the ground circuit is not connected properly, the ground circuit may open under certain overload conditions, and internal live parts are loose or may come loose. These problems can cause either a shock hazard, fire hazard, or intermittent operation of appliances plugged into the power strip.

130. Title: Barriers and Prevention of Laboratory Accidents

Summary: Careful supervision of guest researchers, even highly competent senior scientists, may be necessary to assure compliance with accepted laboratory practices and safety precautions.

Problem/Issue: At approximately 3:33 PM on June 20, 1994, an explosion and small fire occurred in a research laboratory when a mixture of 95% ethanol and sodium peroxide in a one-liter Erlenmeyer flask underwent an unexpected, uncontrolled reaction. The researcher received a small cut, second-degree burns to his

hands, and minor chemical burns to his chest, legs, and face. He was transported to the hospital, treated for his injuries, and released. (Occurrence ORO--MMES-X10CHEMTEC-1994-0008).

131. **Title:** Replacement/Expansion Parts for Telecommunications Network
Summary: Purchase of equipment or components, particularly in fields with rapidly changing technologies such as electronics and software, should be timed to coincide as closely as possible with the date of installation and use in order to minimize cost or loss of functionality due to intervening upgrades, configuration changes, or reliability improvements. Problem/Issue: Communications hardware purchased for a major network expansion approximately one year in advance of installation did not contain upgrades and reliability improvements made later by the manufacturer. It was necessary, at a substantial cost to the company, to return the hardware to the manufacturer to get the upgrade and reliability improvements incorporated.

132. **Title:** Fuel Pool Decontamination Project Unplanned Exposure
Summary: Operators received unplanned exposures from the uptake of airborne contamination while working on decontamination and decommissioning (D&D) of Fuel Receiving and Storage (FRS) pool equipment. The use of utility water to spray sediment off of components that were lifted from the pool likely caused the spread of the airborne contamination. Changes in environmental conditions that may change the associated hazards are not always readily recognized. In this case, historical data from sample results, previous work performed, and expected working conditions were relied upon to prepare the work document. Consideration was not given to the changing water chemistry and the likelihood of contamination in suspension from sediments on components being lifted from the pool. As a result, there was no clear requirement included in the work document mandating that equipment requiring decontamination or the removal of sediment be performed only underwater. Performing this activity underwater would have minimized the spread of airborne contamination.
In addition to performing characterization of environmental conditions where there is potential for the spread of airborne contamination, identifying specific criteria and direction for performing activities in these areas, should prevent such an occurrence from happening again.

133. **Title:** General Purpose Crane Room Enclosure (GCRE) Crane Failure
Summary: As a Decontamination and Decommissioning (D&D) Operations crane operator was lowering the General Purpose Crane Room Enclosure (GCRE) overhead crane hoist hook through a floor hatch, the hook and the full length of the crane cable came off the cable drum and fell to the General Purpose Cell Extension (GCRX) floor located one level down. The operator had not been aware of the crane limitations and extended the wire rope beyond its lowest

safe point of travel. While the design did not permit travel to be extended to the GCRX floor, it was not protected by a lower limit switch.

For infrequently operated equipment like this, it is especially important that procedures and postings be used to communicate precautions and limitations of the equipment to operations and maintenance personnel. Pre-job briefings should be used to review specific equipment limits or safety precautions. Safety mechanisms, such as personal protective equipment, permits, procedures, or postings, can help prevent accidents or injuries, but they cannot assure personal safety. An individual's awareness of their surroundings and in-progress activities is essential to personal safety and prevention of injuries when the unexpected occurs.

134. **Title:** Potential for mercury in Gamewell fire alarm pullboxes
Summary: Gamewell pull boxes may contain mercury switches much like those found in thermostats, pressure switches, and (mercury) check valves. Switches that contain mercury require proper removal and disposal.

135. **Title:** Small Nitric Acid Spill During Decommissioning Activities
Summary: Although the two piping runs were similar, the one associated with the L-12 vessel was different because it contained a longer run of unsupported piping on the side opposite the planned cut from the dip loop. Workers did not recognize that there was sufficient mass in the second piping loop and run which would, as a result of its own weight, cause the loop to lower and release residual liquid from the dip loop. They did not adequately support that portion of the system that was to remain in place and be tested for liquid content after making their cut.

Piping systems that have multiple bends, flanges that are welded or bolted, systems that have been heated or cooled and systems that are unsupported are capable of containing stored energy. This includes mechanical/potential energy in addition to pressure and chemical energy.

Workers need to recognize the potential for unexpected movement when preparing to dismantle or demolish facilities. (ISMS) CF-C, Identify and Analyze the Hazards, CF-D Develop and Implement Hazard Controls.

136. **Title:** Large Drill Bit Failure Results in Near Miss
Summary: Mechanical failures, while a rigging is under strain, is dangerous because of possible missile hazards. Load-indicating devices are recommended where the equipment/tackle configuration could bind the load, which would place a greater stress on the hoist or tackle than would be expected from the apparent hook load.

137. **Title:** ETTP Lessons Learned Teleconference with Greg Eidam on April 19, 2005

Summary: This summary is to capture the lessons learned from ETTP experience in preparing for D&D of the K-25/K-27 facilities. Based on this teleconference valuable information was exchanged in dealing with uranium and technetium contaminated equipment and the strategy to reduce the Hazard Category of the facilities prior to D&D.

138. **Title:** Meeting Minutes on April 3, 2002 Discussion with DOE on BNFL Lessons Learned

Summary: The meeting was held on April 3, 2002 from 9:00 to 12:30 PM to share lessons learned, recommendations, and general information from the BNFL Three Building D&D Project for Consideration and use on the K-25/K27 D&D Project

Lessons Learned

2.0 Lease Transition/Infrastructure, Land Use, and Real Property Management

1. **Title:** Impact of Temporary Movement of Material Between Facilities Should Be Thoroughly Reviewed Against Applicable Inventory Control Requirements

   Summary: Movement of material between facilities must be coordinated with all affected parties, and reviewed for potential impact to both the sending and receiving facilities, even for temporary or in-and-out type of relocation.

2. **Title:** Violation Of Radiological Control Postings

   Summary: All radiological postings must be adhered to regardless of their location or the condition of the facility. Personnel are reminded to contact radiological control operations with questions related to postings. Facility entry plans should take into consideration the selection of tour guides and tour briefings.

3. **Title:** RISK-BASED SCREENING AND PRIORITIZATION

   Summary: Use of metal measuring devices is unsafe when working around energized electrical equipment. Problem/Issue: Improper use of metal measuring devices has resulted in ventilation system shutdown, building evacuation, injury, and hospitalization within the DOE Complex in recent years. In other cases, actual consequences were slight but the potential existed for injury and equipment damage.

4. **Title:** Installation and Operation of Portable Criticality Alarm System Stations

   Summary: Portable criticality accident alarm system (CAAS) stations should be installed and operated in accordance with procedures used by the supplier, and formal detailed operations and maintenance procedures should be prepared and implemented by facility management.

   Problem/Issue: On March 28, 1995, facility personnel performing detector and alarm check activities at the Oak Ridge National Laboratory (ORNL) Molten Salt Reactor Experiment (MSRE) facility discovered that the portable criticality accident alarm system was inoperable. The MSRE has been shut down since 1969 and is currently in the initial phase of decontamination and decommissioning. The occurrence resulted in no elevated radiation levels, no releases of radioactive material, and no injuries or contamination of personnel.

5. **Title:** 110V Fan Control Circuit Incorrectly Left Energized When Building Turned Over to Subcontractor
   Summary: A 110V fan control circuit wire remained energized after the building had been identified to the D&D subcontractor as electrically isolated (with the exception of a few designated circuits). Buildings identified as completely de-energized (i.e., cold and dark) should be isolated from all permanently installed building energy sources with temporary energy systems (electrical, compressed gases, etc.) clearly and unambiguously marked.

6. **Title:** Potential for mercury in Gamewell fire alarm pullboxes
   Summary: Gamewell pull boxes may contain mercury switches much like those found in thermostats, pressure switches, and (mercury) check valves. Switches that contain mercury require proper removal and disposal.

7. **Title:** Active Air Line Cracked by a Trackhoe during Demolition of K-1301
   Summary: The proximity of adjacent equipment, processes, and structures must be fully understood and addressed prior to demolition activities.

8. **Title:** Near Miss Event from D&D Activities
   Summary: Identifying or determining the exact configuration of a worksite is critical before starting an evolution. Even tasks that seem on the surface to be very simple, like opening a door, can have potentially fatal results. A worker was nearly crushed to death when a 12 ton shield door unexpectedly popped out of the doorframe and crashed on the floor.

9. **Title:** PAPR Filter Disengages During Use
   Summary: A deformed gasket discovered during the examination of the failed unit indicates that it was most likely cross-threaded. This deformation of the gasket created a tight seal that allowed the operator to conduct a successful negative pressure test prior to entering the containment tent.

10. **Title:** Wrong Replacement Flapper Valve Used in Respirator Repair
    Summary: The exhalation flapper valve on MSA and Scott respirators were found to be very similar. Extra care should be exercised when replacing these, as well as any components on the PPE. Procedures need to reflect directions on determining correct replacement parts.

11. **Title:** Aging Facilities Issues
    Summary: Old, unused systems can become fragile and behave in unexpected ways.

12. **Title:** Evaluate old or deteriorating equipment prior to use
    Summary: Employees should not use equipment that shows deterioration of parts due to age or usage.

13. **Title:** Near Miss at 782-1H Facility
Summary: When being physically removed from service, control panels must have an absence of voltage check performed on all potential energy sources including all termination points and leads, landed or unlanded, to ensure no hazardous energy is present in the system.

14. **Title:** Near Miss-Abandoned Energized Conductor (SRS)
Summary: This report summarizes an Off Normal occurrence reported at the Defense Waste Processing Facility (DWPF) where an energized electrical box and wiring was detected during removal of a facility trailer believed to have all power sources disconnected.

This Lessons Learned demonstrates the attention to detail that must occur when decommissioning equipment and stresses the following:

- The importance of properly identifying and isolating electrical power sources to decommission equipment.

- The importance of abandoning electrical conductors per site guidelines to ensure no potential for personnel to contact bare conductors exists following decommissioning.

- The benefits of properly stressing and complying with basic electrical safety requirements to prevent personnel injury when uninsulated conductors are found.

Business Unit/Projects should share this information with appropriate individuals/work groups to heighten the Site´s awareness of this event, the causes, and the actions that can prevent recurrence.

15. **Title:** Deficient equipment conditions exist associated with various systems
Summary: Deficient material conditions can affect the performance, reliability and safety of operating equipment.

16. **Title:** Security Lock Disable and Release Functions
Summary: Personnel performing human error analysis of a security incident discovered that the operability of the temporary lock disable and interior lock release functions on the Mas-Hamilton XO7, XO8, and XO9 security locks were not commonly understood by alarmed access area custodians and authorized users. Additionally, information about the two functions was not documented on the lock hardware in a manner that would allow a worker to immediately understand and successfully perform either function without additional knowledge. Nor was information about the two functions readily available in the manufacturer's user guides or captured in LANL requirements and training. Consequently, the possibility existed that a worker could be locked in an alarmed access area and be unable to exit without assistance. To ensure

that a worker who becomes locked in an alarmed access area can quickly determine how to get out, a label was created to provide lock release instructions on the interior of doors with XO7/8/9 locks. Additionally, Los Alamos National Laboratory (LANL) is revising the applicable requirements documents and training to incorporate more detailed guidance on operating the security locks.

17. **Title:** 110V Fan Control Circuit Incorrectly Left Energized When Building Turned Over to Subcontractor

Summary: A 110V fan control circuit wire remained energized after the building had been identified to the D&D subcontractor as electrically isolated (with the exception of a few designated circuits). Buildings identified as completely de-energized (i.e., cold and dark) should be isolated from all permanently installed building energy sources with temporary energy systems (electrical, compressed gases, etc.) clearly and unambiguously marked.

18. **Title:** Salvage Items Released to the Public Without Proper RadCon Surveys

Summary: Project Management and "ownership" of property associated with the scope of work and multiple organizations working together can overlook details.

19. **Title:** Integration of CERCLA and Real Estate Processes to Transfer Land for Economic Development

Summary: The U.S. Department of Energy (DOE) is in the process of cleaning up the Mound Site, with the mission of transferring land for economic redevelopment. As part of this mission, DOE has identified the future landlord of the site: the Miamisburg Mound Community Improvement Corporation (MMCIC), a not-for-profit corporation. After selling the Mound Plant in January 1998 to the MMCIC, under the authority of the Atomic Energy At of 1954, Section 161(g), DOE was challenged with determining the process for transferring that site. DOE successfully completed transfer of its first parcel of land to the MMCIC in March 1999.

20. **Title:** A Lessons Learned Review of the Double Tracks Project at the Nevada Test Site

Summary: The lessons learned review conducted at NTS was facilitated by the DOE Peer Review process. Under this process, an experienced team, composed of DOE, federal and state regulators, and expert consultants, brings lessons learned from around the complex to assist a site in streamlining and improving its assessment and cleanup activities. The peer review team helps the site to work with its regulators to build the support necessary to pursue innovative environmental restoration strategies. A fundamental component of most peer reviews is application of a set of streamlining “principles” identified and developed by DOE and EPA to improve cleanups conducted under RCRA and CERCLA.

21. **Title:** Re-engineering the Facility Disposition Process

Summary: In evaluating the risks to the site meeting its mission of site cleanup and exit by 2005, the Department of Energy's Mound Environmental Management Project (Mound) recognized that it was not conducting its facility disposition projects efficiently. Because of limited communication between the parties responsible for the safe shutdown and decontamination and decommissioning (D&D) processes, Mound was conducting several redundant or overlapping activities. For example, Mound collected the same data in two separate characterization efforts, once for the safe shutdown program and another time for the D&D program. Similarly, Mound conducted risk/hazard identification and closeout activities twice under these separate programs. In addition, Mound was conducting activities that once were required to transfer facilities from Defense Programs to Environmental Management but that became unnecessary when Environmental Management took responsibility for the entire site. By re-engineering its facility disposition process and integrating the safe shutdown and D&D programs, Mound estimates that it has improved the efficiency of facility disposition projects by approximately 30 percent, thereby saving and estimated $142 million in total project costs. The re-engineered facility disposition process fulfills all key objectives and meets all regulatory requirements of the former safe shutdown and D&D programs.

22. **Title:** The Facility "Binning" Process

Summary: The Department of Energy's Mound Environmental Management Project (DOE-MEMP) is working to exit the Mound site by 2005. As part of that mission, DOE-MEMP must disposition all of its facilities, either through demolition or through preparing a facility to be transferred with the property. If site regulators do not agree that a facility is protective at the time that DOE-MEMP is ready to exit, transfer of the property will be delayed and DOE-MEMP will have to conduct additional work to comply with regulatory requirements. Further, in order to leave any demolition debris onsite as fill, site regulators must concur that the material is clean. By increasing regulator involvement in disposition projects through its *Facility Binning Process,* DOE-MEMP has decreased the amount of time required to make facility disposition decisions. Regulators now spend less time reviewing and approving the plans and documentation associated with facility disposition projects. This regulator involvement has provided an additional benefit: DOE-MEMP does not have to guess wheat type and level of data the regulators require. Consequently, data collection is focused only on obtaining specific data required to make decisions and to implement facility disposition.

Lessons Learned

3.0 Regulatory Framework

1. **Title:** Radiological Operations Support Center - Best Practice
   Summary: At the Savannah River Site (SRS), the Radiological Operations Support Center (ROSC) has been established to provide a centralized resource for practical applications of the "as low as reasonable achievable" approach to work as well as a clearinghouse of information. The ROSC consists of mutually supporting groups targeted at efforts in waste minimization and pollution prevention, radiological hazard reduction and safe, cost effective operations.

   In 2003, the ROSC earned an SRS Facility Evaluation Board (FEB) Noteworthy Practice communicated during a FEB evaluation, indicating that this is a particularly effective and efficient, innovative method that has been developed and implemented to meet SRS business needs.

2. **Title:** Rocky Flats Commercial Items Innovative D&D Subcontracting Approach
   Summary: Using the Federal Acquisition Regulation Commercial Items approach in subcontracting specific activities can decrease total project cost.

3. **Title:** Incomplete Radiological Contamination Survey
   Summary: Radiological smear contamination survey techniques may not be effective in identifying particulate contamination that is fixed, semi-fixed, or located under objects. Additional attention to detail is necessary when the potential for such conditions is encountered.

4. **Title:** Efficient DQO/SAP Revision
   Summary: The bullets below summarize the Lessons Learned: * A single independent and qualified person was assigned full time to facilitate and lead this effort and was given the necessary resources to complete the task in a timely manner. An existing, robust DQO process framework was adhered to.

   * The task was well defined, with an established scope, schedule, and clear deliverables.

   * The DOE point-of-contact was involved at the working level and applied his knowledge, experience and strong technical background in the resolution process of this complex technical and regulatory issue.

   * Communication between EPA, DOE, outside technical consultant (Canberra), and ERC project and functional staff was key to this success. The regulators were involved early on and throughout the process, and communication was frequent and substantive. Clear

communication between the project and functional organizations and between the different functional groups helped to clearly identify and resolve any issues.

* Each individual and organization's resolve to solve problems, promoted communication and consensus to accomplish the objectives within the established schedule.

* Staff were willing to be innovative, to think "out of the box," to suspend biases, and to forgo pre-conceived notions. The staff was flexible in their day-to-day assignments as resources were shuffled and deployed to resolve these issues.

* An initial kick-off meeting was held to define the scope and identify the team. Rather than having multiple working meetings, the process was significantly streamlined by developing a draft product for parallel team review. This resulted in a single team meeting being held to refine the final product. This was possible because the scope was well defined and confined to a specific issue.

* Project knowledge coupled with functional technical expertise were significant factors in this success.

* Participation by an independent technical expert was key in lending credibility to the activity and in building trust with DOE and the regulators. Selecting the outside support with the right expertise was key.

* Understanding the political aspects (e.g., public perception, demonstrating control) from a regulator point of view also helped with understanding the problem, determining how the final product should be developed and how DOE and the regulators should be involved.

5. **Title:** Disposable Oil/Water Separator Eliminated Environmental Releases and Hazardous Waste Byproducts
   Summary: In 2000 several Laboratory engineers were awarded a patent on an oil/water separator unit they developed in 1993 for Laboratory compressor/air dryer systems. The units eliminated potential fines for environmental releases, they cost less to install and maintain, and they can be disposed of in landfills or by incineration, eliminating hazardous waste handling and disposal costs.

6. **Title:** Continuous Air Monitor (CAM) Calibration
   Summary: Procedures need to be adhered to when calibrating Continuous Air Monitor (CAMs).

7. **Title:** Waste Characterization Must Account for Dilution
   Summary: Regulatory dangerous wastes that are diluted to non-hazardous status when consolidated with similar waste streams must be accounted for when considering land disposal restrictions (LDR). If

diluted wastes are not accounted for by their codes, they may be improperly managed without being treated as required prior to land disposal.

8. **Title:** Legacy Contamination Found
Summary: Other DOE sites that have the potential for unidentified contamination areas should evaluate their operations for this lessons learned. Job planning for work that is to be performed in areas where current radiological survey information is not available should include actions requiring the radiological surveys to be performed and contingency plans detailing the steps to be taken if contamination is detected.

9. **Title:** Accelerating the RI/FS Process for the Old Radioactive Waste Burial Ground at the Savannah River Site
Summary: Considerable cost savings and schedule reductions are possible in the remedial investigation/feasibility study (RI/FS) process using streamlining principles identified and developed by DOE and EPA and applied at SRS.

10. **Title:** Fixed Contamination Becomes Removable
Summary: Fixed contamination was rendered removable because of less-than-adequate bonding of the fixative coating to the metal surface.

11. **Title:** Reduction in Radiation Contamination Surveying Requirements for Off-Site Shipments
Summary: Summary) Development of a plan to characterize and test scrap metal for facilities never used for radiological operations, can reduce the requirement for surveying materials taken off-site for radiation contamination. (Detailed) Cost was reduced by not having to perform 100 percent surveys of the metal leaving the site. The rad protocol was introduced as an alternative to the requirements of DOE Order 5400.5C because Project personnel believed that a less stringent survey would be acceptable. The purpose of the DOE Order is, to protect employees, the environment, safety and health of the community. The rad protocol was used to prevent excessive and unnecessary characterization based on the facts known about the site.

12. **Title:** Cyclohexylamine Release in Excess of Reportable Quantity
Summary: The INEL site was releasing a cumulative total of 1.1448 lbs/day of cyclohexylamine (a boiler water corrosion inhibitor) which is listed on the Extremely Hazardous Substance List in 40 CFR 355. The reportable quantity is 1 lb/day. Twenty boilers were identified as using products containing cyclohexylamine. A continuous release report was filed with the State and Local agencies.

This chemical is not required to be reported under SARA 313. There are three points LITCO has found to be significant at this time in relation to this event.

1. Requirements under EPCRA state that all facilities at a

contiguous site must be totaled to determine release rates.

2. Need to look at total number of boilers operating within the contiguous site.

3. Most amine-based treatments contain cyclohexylamine.

13. **Title:** Falsified Quality Assurance Inspection & Test

Summary: All required quality assurance inspections and tests shall be properly performed and documented. Unethical and illegal practices such as failure to perform tests and inspections properly, falsifying records, and the sale of non-conforming parts are the symptoms of a deeper problem in an organization. Criminal activities to this degree can not occur without the knowledge and complicity of employees at all levels.

Problem/Issue: On January 10, 1995, Lucas Western Inc. (Lucas) pled guilty to a 37-count criminal investigation. The charges stated that Lucas made false statements to the Department of Defense when it certified that several product's tests were properly performed. In fact, those tests had not been performed or not properly performed.

14. **Title:** Expediting the Removal Approach for Remediating and Releasing the Mound Plant

Summary: The improvement of Mound's soil remediation strategy was facilitated by the DOE peer review process. Under this process, an experienced team, composed of DOE, federal and state regulators, and expert consultants, brings lessons learned from around the complex to assist a site in streamlining and improving its assessment and cleanup activities. The peer review team helps the site to work with its regulators to build the support necessary to pursue innovative environmental restoration strategies. A fundamental component of the peer review conducted at Mound was the application of a set of streamlining "principles" identified and developed by DOE and EPA to improve cleanups conducted under RCRA and CERCLA.

15. **Title:** Planning and Implementing RCRA/CERCLA Closure and Post-Closure Care When Wastes Remain Onsite

Summary: This information Bulletin is primarily intended for personnel with project management responsibilities for Department of Energy (DOE) environmental restoration or waste management projects conducted pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or the Resource Conservation and Recovery Act (RCRA). It describes issues faced at CERCLA sites and RCRA facilities/units undergoing closure and post-closure care ***when wastes will remain onsite or groundwater is contaminated,*** and discusses techniques for addressing these issues effectively. [Note: this

Information Bulleting does not discuss closure when no wastes remain onsite (i.e., clean closure under RCRA, or cases resulting in unrestricted land use under CERCLA or RCRA corrective action).]

Post-closure care is required when hazards remain onsite (e.g., contaminants remain above risk-based or other regulatory levels) and "barriers" are in place to prevent exposure of humans and ecological receptors to these hazards. In this Information Bulletin, the term "barrier" is defined broadly to include any administrative or engineered device in place to prevent unacceptable exposures to hazards (e.g., covers, fencing, land use restrictions, pumping and treating of groundwater to prevent migration of contaminants). Specifically, this Information Bulletin describes how four principles, consistent with and based on the Principles of Environmental Restoration (as outlined in Highlight 1), may be used as a framework for effectively complying with regulations and addressing issues associated with closure and post-closure care.

Lessons Learned

4.0 Program Management

1. **Title:** Criticality Deficient Drum
   Summary: Only complete and accurate data should be used to assure that materials being packaged in containers are within the established Criticality Safety Limits.

2. **Title:** Integrated Basin Closure Subproject Lessons Learned
   Summary: Synopsis This document presents a brief summary of the closure document that was prepared upon completion of the Integrated Basin Closure Subproject and provides a link to the entire report. The Idaho Completion Project (ICP) was faced with a major challenge - cleaning and preparing aging spent nuclear fuel basins for closure by removing sludge and debris, as necessary, and removing water to eliminate a potential risk to the Snake River Plain Aquifer. The lessons learned contained in this document should aid others in preparing for and accomplishing future similar projects.

   LL Statement Although many lessons learned are presented in the Integrated Basin Closure Subproject document, the top tier lesson learned was that having a dedicated mature project team that is willing to think/work "outside the box" is the key requirement to ensuring project success.

3. **Title:** Two Workers Exceed Administrative Limit for Radiation Exposure
   Summary: Two facility workers were exposed to ionizing radiation at an uncharacterized dose rate that was subsequently determined to be one to two orders of magnitude greater than the general area dose rates typically encountered in the work area.

   Investigations revealed that management had failed to establish and reinforce expectations regarding the control of work scope, evaluating radiological hazards, and implementing controls to ensure occupational doses are maintained ALARA. An in place, well established and well documented work control program did not prevent failure to effectively implement the program in all circumstances. Broadly written work instructions had placed increased reliance on the skill of the workers and their supervisors to ensure worker protection. Finally, when unexpected changes occurred, workers failed to recognize the impact of the changes and stop work.

4. **Title:** Systematic reviews of historical records may result in a need to revise inventory estimates contained in safety basis documentation
   Summary: Systematic reviews of historical records may result in a need to revise inventory estimates contained in safety basis documentation. Contemporary characterization efforts, including

nondestructive assay techniques and physical sampling and laboratory analyses, may result in inventories that differ from historical inventories in both quantity and identity of radionuclides.

5. **Title:** Industrial Safety Hazard Resulting from Breached Compressed Gas Cylinder
   Summary: Areas in and around nuclear facilities that were used for disposal and storage of scrap materials from past operations may contain unknown or un-quantified radiological, chemical or industrial safety hazards. Process knowledge determinations or other disposal documentation may not provide accurate descriptions or status of scrap materials. Personnel working in these areas should be trained to identify these potential hazards and be prepared to use stop work authority to ensure these hazards are promptly mitigated or corrected in order to prevent injury to personnel, equipment or the environment.

6. **Title:** Subcontractor Employee Injured in Fall from Fixed Ladder
   Summary: 1. Identified hazards (i.e., obstacles adjacent, behind, and overhead the ladder's path) must be clearly communicated to users of fixed ladders. 2. The process for communicating known deficiencies for fixed ladders between UT-Battelle and other contractor-controlled areas does not adequately control potential hazards. 3. Owners of fixed ladders must be responsible for maintaining the equipment to ensure safety of users.

7. **Title:** Recognizing What is Included in Your Work Scope
   Summary: Because certain types of work such as research and development, decontamination and decommissioning, and work with legacy materials inherently involve unknown hazards, work planners should consider establishing hold points for these types of work activities to ensure that workers periodically evaluate current conditions against established hazard controls and work authorization documents.

8. **Title:** Torch Cutting Results In Clothing Fire
   Summary: Welding and cutting events have resulted in fires, personnel injuries, and fatalities.

9. **Title:** Subcontractor Estimates of Fissile Material
   Summary: Subcontractor processes and assumptions for performing nondestructive assay (NDA) analysis and fissile material estimates should be independently verified for accuracy for the materials and components being measured.

10. **Title:** Fixed Contamination Becomes Removable
    Summary: Fixed contamination was rendered removable because of less-than-adequate bonding of the fixative coating to the metal surface.

11. **Title:** Cost-Effective Planning for Facility Disposition

Summary: Integrating safety and health considerations into facility disposition planning can reduce costs as well as ensure environmental, worker, and public safety.

12. **Title:** Including All Project Costs Required for Implementation

Summary: Project Cost Estimates should consider all costs including decontamination and decommissioning required to implement the project. Problem: The Bethel Valley Low Level Waste Collection and Transfer Line Item Project (88-R-830) was submitted for approval without including decontamination costs required to perform the project. These costs which are expected to exceed $1M are planned to utilize operating expense funding. Expense funds appear to be available; however, if the expense funds are not available the project cannot be completed.

13. **Title:** Effects of Hoisting and Rigging Activities on Equipment Important to Safety, Potential Inadequacy of the Safety Analysis (PISA)

Summary: When performing deactivation, demolition, and construction activities ensure Unreviewed Safety Question Determinations (USQDs) adequately address risks that may be encountered related to equipment important to safety.

14. **Title:** Incorrect Determination for the Unreviewed Safety Question Determination (USQD) for the Radiation Criticality Alarm System (RCAAS) Horn Installation

Summary: FOR INTERNAL USE ONLY OFFICIAL USE ONLY

NOTE: Contains information which may be exempt from public release under the Freedom of Information Act (5 U.S.C. 552), exemption number(s) 2 circumvention of statute information. Approval by the Department of Energy prior to public release is required.

LESSON LEARNED STATEMENT: USQD preparers as well as reviewers and approvers should be cognizant of the equipment important to safety (EIS) identified within a facility's safety basis (SB) and any applicable technical safety requirements (TSRs) associated with that equipment. If a proposed change requires that a TSR be changed or modified, such as the addition of a surveillance requirement (SR) or limiting condition of operation (LCO) to accommodate for a new configuration, then the first question of the USQD should be answered "Yes" and the appropriate actions taken (i.e., DOE should be notified). USQD evaluators should not necessarily agree with the results of other review bodies, such as Configuration Control Boards, without a thorough evaluation of the applicable safety basis, which includes the TSR bases.

15. **Title:** TAN-616 RCRA Closure/DD&D Project Lessons Learned - Good Work Practice

Summary: This document presents a brief summary of the closure document that was prepared upon completion of the demolition of TAN-616 and provides a link to the entire report. The lessons learned contained in this document should aid others in preparing for and accomplishing future similar projects.

Although many lessons learned are presented in the TAN-616 closure document, the top tier lesson learned was that having a dedicated mature project team that is willing to think/work "outside the box" is the key requirement to ensuring project success.

16. **Title:** Air-driven Pumps Not Evaluated in Safety Analysis

Summary: Event summary - Unreviewed Safety Question (USQ) evaluations for installing air driven pumps in tank D-5 at the Plutonium Finishing Plant (PFP) discounted them as a source of aerosolization even though their supply air pressure was significantly higher than the pressure of the steam supplied to the previous pumps.

New Safety Basis documents should include extensive examination of old and new accident analyses to ensure that all scenarios and conditions are considered.

When performing Facility Modification USQ Evaluations, personnel should carefully examine any existing Hazard Analysis for adequacy, even if the modification appears to be simple.

17. **Title:** DOE Complex Ladder Injury Incidents

Summary: Ladder injuries continue to occur at sites across the DOE Complex. It is imperative that proper safety measures (procedures, training, disciplined operations, questioning attitude) are followed to prevent such ladder events at SRS.

18. **Title:** Tractor-Trailer Off-load

Summary: In support of work for the K-25/27 D&D Project, the Field Services section recently placed an order for a prefabricated structure to be used as a shop. Due to the lack of communication with the manufacturer as to the contents of the shipment project personnel were not prepared to receive all of the components when the order arrived. The ensuing complications of bringing the delivery truck on-site and getting the material off-loaded created several last minute scrambles that could have been avoided.

19. **Title:** Team Approach Effective Handling and Removal of UF-6 Line

Summary: During deactivation of the 247-F Facility at SRS, uranium hexafluoride (UF6) process lines needed to be removed. The project team evaluated the hazards and devised a plan to eliminate or mitigate each hazard; one process line was plugged with material and blanked over 10 years ago. Project personnel

employed a "team hazards analysis" approach using the Automated Hazards Analysis (AHA) program. Team members from Industrial Hygiene, Engineering, Radiological Controls, and Project Management participated in briefings and conducted mockup training. This team AHA approach led to the successful removal of the UF6 and associated process lines.

20. **Title:** Air-Fed Suit Foot Separations
Summary: User inspections of anti-contamination clothing (Anti-Cs) are the last line of defense for suit safety.

21. **Title:** Line-Of-Sight Obstructions Can Result in Accidents and Injuries (SRS)
Summary: Maintaining line-of-sight and communicating effectively are key factors in performing jobs safely. This is particularly important for D&D workers when working around walls, dry wall, and obstructions.

Extreme care must be taken when workers are separated on opposite sides of walls, line-of-sight obstructions, etc., and are coordinating tasks such as drilling or cutting conduit, supporting or holding sections of pipe to be cut, or tracing wires through walls.

22. **Title:** Control of Hot Work - Significant Operating Experience Report From Site D&D (SRS)
Summary: Hot Work is defined as the use of portable acetylene welding and cutting torches, electrical welding, blow torches, melting pots, portable furnaces and heaters, grinding, and open flames.

Hot Work performed in the vicinity of combustible materials may result in a fire. The absence of a fire watch may enable fire spread to extend beyond expected limits.

If not continuously verified to be in place, protective measures may not mitigate the hazard. Changing conditions should be noted and protective measures reaffirmed as needed.

23. **Title:** Recognition of Asbestos-Containing Materials (SRS)
Summary: During D&D work activities, ensure that you question working with the materials listed in the attachment if the necessary asbestos work controls have not been established.

24. **Title:** Fire Caused by Misapplication of Foam Used to Fill Large Voids
Summary: Fire can result from incorrect application of an exothermic foaming agent when site procedures and material specifications are not followed.

25. **Title:** Proceeding With Hot Work Permit Prior to Obtaining Feedback from Fire Department
Summary: Prior to initiating hot work activity, all required procedural steps must be fully executed to ensure that potential hazards are

identified and controls are in place. Feedback to verify controls are in place must not be assumed prior to work beginning.

26. **Title:** Criticality Safety in a D&D Environment
Summary: A number of valuable lessons regarding criticality safety have been learned from deactivation and decommissioning (D&D) activities within the DOE and from significant events in other communities, most notably Toki-Mura in Japan. The referenced document provides some of those key lessons learned that are expected to be valuable to facility and project managers planning D&D work.

27. **Title:** Management Concern at New Hydrofracture Facility (NHF) Building
Summary: When planning decontamination and decommissioning (D&D) activities that involve the draining of fluids from equipment (i.e., heat exchanger/drying units, etc.), projects should ensure proper planning is done by the subcontractor. Planning should include a contingency plan in the project Activity Hazard Assessment (AHA) that covers fluid spills. Provisions must be included for proper containerization of the equipment fluids during D&D operations.

28. **Title:** Laborer's Personal Protective Equipment (PPE) Burned Below Mid-Shin on Right Leg While Cutting Rebar With a Portable, Abrasive Wheel Saw (i.e., cut-off machine)
Summary: Hot work is any work involving burning, welding, cutting, or similar operations that is capable of initiating fires or explosions. The use of abrasive wheel cutting saws (hereafter referred to as cut-off machine) can generate hot surfaces and a large quantity of hot sparks that must be controlled. Sparks from cutting metal can burn or cause clothing to catch fire. Operators must have knowledge and training in tool manufacturer's safety manual and observe warnings.

29. **Title:** Contamination Control Coating Doesn't Hinder Fire Suppression
Summary: The coating, CC Wet, can be utilized in sprinkler protected areas to control airborne contamination without adversely affecting the sprinkler head response.

30. **Title:** Marking Equipment and Systems In Support of Decontamination and Decommissioning (D&D
Summary: Good work practice to provide guidance on the use of status markings for D&D activities.

31. **Title:** Workers Avoid Injury by Anticipating the Unknown
Summary: Individuals should anticipate poor stacking and packaging configuration to avoid injury when removing heavy materials from packaging material.

32. **Title:** Cut 110 Volt Wire
Summary: When performing electrical maintenance activities, be aware of unmarked circuits and unidentified wires even after all known

power feeds have been disconnected and locked out and voltage checks performed. Expect the unexpected. Always treat wiring and equipment as if it is energized until you prove there is no electricity present. Individually verify that every wire is de-energized before cutting by using a contact and proximity type voltage measuring devices. Wear the same personnel protective equipment (PPE) you would wear for energized work; such as, insulated tools, insulated gloves and, if possible, use a rubber mat.

33. **Title:** Personal Ice Cooling System Cool Suits Can Prevent Heat Stress
Summary: Under supervision of an Industrial Hygienist, the Personal Ice Cooling System (PICS) cool suits were used during D&D of the INEEL Test Area North PREPP facility to keep workers cool and extend their stay times. The PICS allowed workers to stay in the work area much longer than normally allowed, while keeping their body temperatures in a safe range. The ice bottles can be changed out when needed (usually every 1-2 hours), allowing workers to stay even longer, and avoiding the time and expense of extra PPE doffing/donning.

34. **Title:** Hard-to-Detect Radionuclides Lessons Learned - Characterization
Summary: 1. Each area must be characterized using all available data for projected activities. Surface contamination measurements are appropriate for non-destructive activities, but must be supplemented by volumetric data when intrusive activities are performed.

2. A 'one instrument fits all conditions' approach requires analysis to substantiate. While many probes will work in most situations, analyze the characterization data to determine the most appropriate instrument deployment and methods.

35. **Title:** Common-Sense, Collaborative Approach to Deactivation Saves Time and Money
Summary: Deactivation (and D&D) project design can successfully utilize a common-sense, low-technology, collaborative approach. Time and money can be saved by avoiding overdesign of a short-term, one-of-a-kind project. Conducting criticality safety, safety analysis, engineering, mockup/remote development, maintenance, and operations concurrently may be possible. Team members with past experience at a facility may bring additional knowledge not otherwise available.

36. **Title:** Work Control and Procedural Compliance
Summary: Bechtel Jacobs Company (BJC) Managers of Projects, Project Managers, Subcontract Coordinators, Functional Managers, and Project Function Leads must ensure that subcontracts adequately address the appropriate requirements, that the subcontractor understands those requirements, and that the projects and functional organizations provide effective oversight of subcontracted and self-performed work to verify that the stated

requirements are being effectively implemented. U.S. Department of Energy (DOE) finding WM-040730-A.

37. **Title:** Building 9212 Stack 27 Criticality Safety Deficiency DEF-48-04
Summary: Delay of needed maintenance results in Criticality Safety Deficiency.

38. **Title:** FACILITY OFF-GAS SYSTEM NOT STARTED DURING FACILITY STARTUP
Summary: Following established work process controls is critical to maintain compliance with operational safety standards and environmental permits.

39. **Title:** Failure to Report an Unusual Indication of Airborne Radioactivity
Summary: Radiological Control Technicians (RCT) must notify management of any activity or reading that is above normal or expected levels.

- Instrument indicators must be believed and results posted.

- Management must reinforce the requirement to report unusual indications of airborne radioactivity so they are fully informed and appropriate radiological decisions are made.

40. **Title:** Verbatim compliance with procedures is not just a part of Conduct of Operations compliance...it can save your life!
Summary: Communication and verbatim compliance with procedures are not only part of compliance with the tenets of Conduct of Operations, they are as basic to safety in our day-to-day jobs as looking both ways prior to crossing a busy street.

41. **Title:** Work Permit Discrepancy
Summary: Organizations entering Beryllium areas must confirm training requirements prior to entry into operational areas.

42. **Title:** Graduate Student Incurs Laser Injury to Eyes
Summary: Inadequate development and implementation of laser safety controls can result in severe/permanent eye damage.

A Brookhaven National Laboratory (BNL) investigation team evaluated a laser incident, which occurred on September 9, 2003, and identified many missed opportunities to prevent the accident. The observations and lessons described below primarily reflect the perspective of laser owners and users. The corrective actions listed at the end of this document address implementation of BNL requirements within the Chemistry Department. Discussion and lessons learned of laboratory-wide issues are addressed in Reference #3.

43. **Title:** Employee Did Not Know the Difference Between TLD and PNAD
Summary: Where Department of Energy (DOE) sites are shared by multiple contractors, including Nuclear Regulatory Commission (NRC) or agreement-state licensees, the resultant variety of approaches to access control and dosimetry can lead to confusion and noncompliance.

Managers/Supervisors/Sponsors/Escorts must ensure that proper dosimetry is obtained for access to fissile material handling and radiological areas. All workers must ensure they understand the applicable requirements and make inquiry with knowledgeable, experienced personnel prior to entering an area with which they are unfamiliar.

44. **Title:** Controlling Contamination from Medical Radionuclides
Summary: Employees caring for someone receiving radionuclide therapy (e.g., Iodine 131) can easily pick up traces of the isotope used for treatment. Those traces can complicate routine contamination surveys of the worker.

45. **Title:** Project Planning, Preparations, Readiness Reviews, and Start-up of Off-Specification Material Operations in Building 9720-5.
Summary: The successful start-up of the Off-Specification Material Operations project required team support and cooperation. The team overcame many obstacles that arose from various sources. A major contributor to the projects' ability to anticipate and mitigate these obstacles included the early assignment of a project team including a project engineer, process engineer, and readiness leader. The team immediately began the development of the scope, cost, and schedule required to accomplish the defined project objectives. The team ensured constant attention to the details of preparation, strict adherence to procedural requirements and solid and open communication of issues enabling preparations to proceed as smoothly as possible. In addition, the project was committed to allowing extensive practice in developing the necessary confidence and poise needed to successfully operate and demonstrate this readiness for operations. The project conducted a through Management Self-Assessment and aggressively resolved issues as the review team identified them. First-use start-up planning and management were key to successfully overcoming the unknowns associated with evolutions.

46. **Title:** Lack of Management Review of Waste Shipment Documentation
Summary: Proper review of waste shipment packages is essential to ensure that all contractual obligations, including ES&H requirements and proper radiological procedures, are strictly enforced.

47. **Title:** Inadequate Implementation of Combustible Control Program
Summary: Implementation of Documented Safety Analysis (DSA) and Technical Safety Requirements (TSR) demands the highest level of rigor in the procedures used to implement the new Safety Basis,

to conduct the DSA Implementation Verification Review (IVR), and to verify satisfactory disposition of all IVR findings. These expectations for rigor need to be defined clearly in a procedure, rather than only in a non-binding guidance document.

48. **Title:** Responding to Conflicting Emergency Conditions
Summary: When confronted with emergency signals requiring conflicting actions, facility management must quickly determine the greater threat and instruct personnel to respond accordingly. In the absence of such direction, personnel should attempt to determine relative risks on their own.

49. **Title:** Inadequate Project Configuration Management
Summary: Project Management, Technical Support, and Operations Management should be cognizant of the established configuration management process in place and use these processes to ensure modifications to the project and/or systems, structures, or components (SSCs) are adequately reviewed, approved and documented and that project turnover requirements are met prior to operating equipment.

50. **Title:** Unauthorized and Improperly Controlled Project Work
Summary: Comments on a project during the design phase should be formally documented and dispositioned. Comment resolutions should not be considered complete until controls have been established to implement those resolutions.

When work is performed near a fire alarm, the system should be inactivated whenever practical and interim measures approved by the Fire Protection System Design Authority should be put in place. Fire alarm systems that remain active while they are not in a normal mounted configuration should be closely controlled.

Only personnel experienced in the facility should authorize daily construction activities. They should closely monitor construction work to ensure active facility systems are not inadvertently disturbed by construction personnel.

Construction activities should be discussed in detail at pre-job briefings. Changes to the Daily Activity Sheet should be approved by the facility project interface coordinator.

Configuration of replacement components should be verified prior to placing them in active service. Acceptance testing should be established such that component configuration is verified prior to relying on the component to perform its intended function.

Testing of safety systems should be an integral part of the acceptance test program for construction activities to verify preconstruction conditions were not altered. Even if there is reasonable assurance that construction activities did not impact system performance, acceptance test program criteria should

include a specific requirement to verify alarm audibility in all areas of the facility impacted by construction activities prior to allowing unrestricted access.

51. **Title:** Bagless Transfer System Management Self Assessment

Summary: Implementation of safety basis controls (Safety Limits, Limiting Conditions for Operations, or Administrative Controls) should be screened against the criteria of HNF-PRO-055, Facility Start-up Readiness, to determine the level of review required. As a minimum, an independent review to verify readiness for operation should be performed.

A Management Self Assessment (MSA) that verifies implementation of safety basis controls should be rigorous. The scope of the review should be questioned if it includes an already implemented and in use control.

MSA lines of inquiry must include the entire scope of the operation.

52. **Title:** Lessons Learned from the ISM Internal Assessment

Summary: Internal/Self -Assessments are a valuable tool for determining "State-of-Condition". The ISM internal assessment identified areas for improving next year's assessment that may also be used in planning self-assessments as well as audits and surveillances. Thorough, detailed, and advanced planning contributed significantly to the success of the review process.

53. **Title:** Ineffective Training Management Delayed Urgent Work

Summary: The training status of personnel with specialized training or qualification should be verified well in advance of critical path evolutions that require that special qualification.

Trainers must be technically qualified in a specific area before they train other personnel in that area.

54. **Title:** Communications with Radiological Controls Personnel Essential for Safety

Summary: Proper communication to the attendant Radiological Control Technician (RCT) of elevated or fluctuating readings when conducting an exit frisk is essential for protection of the worker, the public, and the environment.

55. **Title:** Failure Of Management To Take Appropriate Action In Response to CSR Violation

Summary: Managers need to evaluate and thoroughly understand the causes associated with non-compliance actions within their operating areas. Criticality safety violations, radiological control violations, procedural violations, etc. need to be reviewed to ensure that the specific non-compliance is corrected, that appropriate measures are taken to prevent reoccurrence, and that other areas with similar problems are identified.

56. **Title:** Improper Record Keeping
Summary: Company procedures and employee training should include directions on how to replace an active damaged record (e.g., oil soaked, contaminated etc.). Clear concise and accurate record keeping is essential to maintaining the integrity of the work processes. It should be conveyed to all employees that the consequences for improper record/log keeping could lead to unsafe work conditions and/or result in violations (fines) under the Price Anderson Amendment Act.

57. **Title:** Lack of Common Understanding of Requirements Leads to Failure to Meet Customer Expectations
Summary: Prior to beginning a readiness assessment, both the evaluate and evaluator should have a common, clear understanding of requirements/expectations for each activity being evaluated.

58. **Title:** Inadequate On-the-Job Training Results in Ad Hoc Area Sweeps
Summary: Informal on-the-job training may lead workers to subjectively interpret process requirements or to skip steps in multi-step processes. Therefore, safety-related processes such as area sweeps should be documented and formal training should be conducted to ensure consistent performance. Including a checklist in formal documentation helps workers accurately complete multi-step processes.

59. **Title:** Concerns Associated with Construction Activities in Criticality Accident Alarm System (CAAS) Coverage Areas
Summary: Determination of a need for CAAS coverage should be included in the design phase for construction projects. Additionally system speakers may be necessary such that coverage is maintained throughout the construction activity or compensatory measures are specified.

60. **Title:** Inadequate Pre-Job Briefings and Failure to Communicate as Causal Factors
Summary: The Operating Experience Weekly Summary, No. 97-02, has released an article entitled 'Pre-Filter Changed-Out Without the Correct Personal Protective Equipment' in which an incident at the Hanford Site is used as a springboard to discuss the issue of adequacy of pre-job briefings and communications.

Other incidents are cited, and a table is provided showing the 'contribution of management problems by causal codes.'

61. **Title:** Fermilab Necessary and Sufficient Closure Process Demonstration
Summary: The following Good Work Practices for the Necessary and Sufficient Process have been identified based on the experiences at Fermilab: (1) Process Leader - The role of the Necessary and Sufficient (N&S) Process leader is to coordinate a complicated mix of working and advisory groups (Convened Group, Extended

Convened Group, Steering Committee, Identification (ID) Team, and focus groups) and focus group leaders toward implementation of the N&S Process. (2) Time and Hard Work - A successful N&S Process requires a lot of hard work by qualified and motivated people. In particular, the ID Team phase of the work required significantly more time and effort than anticipated by the process leader. (3) Careful Organization - Careful organization of each step of the process, including faithful implementation of the prescribed formalities of the process is very important. In the Fermilab Pilot Process, the organizational effort prevented many misunderstandings and contributed to continued buy-in by all interested parties as the ID Team's work progressed. Efforts of the process leader to inform all interested parties about the progress of the process were most worthwhile. (4) Facilitator - Participation of a management consulting firm in the Fermilab N&S Process was helpful, especially in its role as a Process facilitator at the outset of the ID Team's initial two-week period of concentrated work in mid-May. The facilitator introduced several concepts (use of flip charts, group rules, specific goals, predetermined breaks, role playing/devil's advocate) that proved to be useful in keeping the Team and focus groups concentrated on the issues, the process, and the final objective. (5) Standards versus Implementation Plans - One must understand the differences between a standard and an implementation plan. Standards are universal. Implementation plans are the site-specific methods used to ensure compliance with the standards. An implementation plan should not be adopted as a standard. (6) Occupational Safety and Health (OSH) Issues - The scope of the work of the OSH Focus Group was too broad. Over 100 Environmental, Safety, and Health (ES&H) hazard issues identified by the people at Fermilab were in the OSH area. Assessment of these issues by a least two separate focus groups probably would have been more effective. (7) Boundary Conditions - The Process leader must define the boundary conditions during the ID Team operation. It is important to clarify ES&H issues and to determine which other closely related issues should be included in the Process. Examples of this are property loss prevention in the fire safety area and safeguards and security considerations in the emergency response area.

62. **Title:** Take Two for Safety" Program at K-25
Summary: The K-25 Site has adopted the 'Take Two for Safety' Program. This program is teaching employees enhanced personal responsibility and awareness towards safety.

63. **Title:** Material Handling and Storage
Summary: Requirements concerning handling, processing, and storing of material must be established and documented early in project planning. Problem: Changes in requirements handling, processing, and storing of materials can result in significant impacts on project scope, cost, and schedule.

64. **Title:** New NDA Results Invalidate Facility Safety Documents

Summary: Non-Destructive Assay (NDA) of a glove box found material hold-up values greater than allowed by the Criticality Safety incredibility study, invalidating that study and requiring that safety controls be implemented.

People who base analyses on NDA data are responsible for ensuring that the data are applicable to their needs. Management must ensure that end users can establish the applicability of NDA data and understand how changes in the process can affect documents based on those results.

65. **Title:** Unauthorized Tampering with the RCAAS Detector Module Fuses During Decontamination and Decommissioning Walkdown.

Summary: Personnel must adhere to their defined scope of work and established procedures. Working outside the established scope of work, procedures, and administrative controls may introduce potentially serious hazards to personnel and facilities.

66. **Title:** 233-S Plutonium Concentration Facility Demolition

Summary: The document listed in the reference section relates many positive lessons learned from the successful open air demolition of the highly contaminated 233-S Plutonium Concentration Facility at Hanford. This was the first plutonium facility in the DOE Complex to have been demolished without first being decontaminated to near "free-release" criteria. Details and background information can be found in the full report.

Lessons Learned

5.0 Miscellaneous Initiatives

1. **Title:** Hot Slag Ignites Flexible Exhaust Duct at NRC Facility
   Summary: Timely identification by the fire watch of a fire started by hot slag while performing cutting and welding operations prevented serious injury to the welders.

2. **Title:** Personnel Protective Equipment Prevents Injury
   Summary: An effective Activity Hazard Assessment (AHA) and use of proper personnel protection equipment can protect project personnel from potentially serious injuries.

3. **Title:** 480 Volt Near Miss
   Summary: Energized work should only be performed when absolutely necessary. In addition, when circuits are checked for power, the check should be thorough, including several points to ensure all power sources are identified.

4. **Title:** PCBs Detected In Raw-Water Storage Tank
   Summary: Pre-demolition characterization sampling of tanks and equipment prior to initiating work should be used to identify potential hazards.

5. **Title:** Glovebox Standards
   Summary: The DOE standards for design, fabrication, installation, operations, maintenance, and decontamination and decommissioning of gloveboxes need to be established, understood and implemented at all applicable DOE facilities.

6. **Title:** Dropped Load During Hoist Operation
   Summary: Work control documents must be "stand alone" including detailed planning steps that clearly define how the work should be accomplished. Vendor manual instructions must be reviewed for guidance and should be included as reference in the work control document when feasible.

7. **Title:** Training & Regulations Emphasized as WSRC Personnel Accept Different Work Assignments
   Summary: As personnel accept new job roles and responsibilities, it is imperative that the workers are fully trained to the task and have a complete understanding of the regulations and guidance requirements applicable to the new job.

8. **Title:** Impact of Temporary Movement of Material Between Facilities Should Be Thoroughly Reviewed Against Applicable Inventory Control Requirements
   Summary: Movement of material between facilities must be coordinated with all affected parties, and reviewed for potential impact to both the sending and receiving facilities, even for temporary or in-and-out type of relocation.

9. **Title:** Large Drill Bit Failure Results in Near Miss
Summary: Mechanical failures, while a rigging is under strain, is dangerous because of possible missile hazards. Load-indicating devices are recommended where the equipment/tackle configuration could bind the load, which would place a greater stress on the hoist or tackle than would be expected from the apparent hook load.

10. **Title:** Defect Discovered on MSA PAPR Hoods
Summary: TBD

11. **Title:** Failure of Square D Molded Case Circuit Breakers
Summary: Molded case circuit breakers are designed to isolate an electrical circuit by either being turned off manually or by tripping open electrically due to overcurrent conditions. Inadequate preventive maintenance, failure to periodically exercise the breaker, adverse environmental conditions, or service age can cause the internal operating mechanism to become inoperable thus preventing the breaker from being opened or closed. Equipment and facility damage can result due to the failure of a circuit breaker to open under fault or overcurrent conditions

12. **Title:** Worker Cut Into Energized 240-Volt Circuit
Summary: Prior to starting decontamination and decommissioning (D&D) activities, the controlling organization must ensure energy sources are deenergized through the use of isolation or lock & tag. Field engineers and knowledgeable craft personnel should perform system walkdown of all energized lines to determine the energy source and how to isolate for lock & tag purposes.

13. **Title:** Worker Protection During D&D Activities
Summary: In order to minimize personnel contamination, heat stress, and other health and safety concerns, Decontamination and Deactivation (D&D) activities must be thoroughly reviewed prior to commencement and all anomalies encountered during the hands-on D&D activity must be effectively communicated to site personnel.

14. **Title:** Identification and Incorporation of Equipment and Procedural Issues in a Timely and Proper Manner
Summary: During start-up or use of equipment, issues identified during development or execution of a procedure should be documented and shared with all personnel performing the work. If the issue indicates that the procedure/process cannot be completed, the work should be stopped and corrections made before proceeding. If the issue is one that does not require stop-work or immediate correction, it should be documented in a PMR, either pen and ink changed or placed in the history file for future changes, and discussed with all personnel supervising or performing the work.

15. **Title:** Container Selection and Usage for Shipment of Waste Material
Summary: Editor's note: The following is one of a series of seven lessons learned issued as a result of a cause analysis conducted to evaluate adverse trends in packaging and transportation incidents.

Container selection and usage must not only consider the waste material to be packaged but also the packaging material, environmental conditions during packaging, and other factors that may affect package integrity.

16. **Title:** Recurring Material Handling Problems

Summary: Mechanical material handling (the use of motorized mechanical equipment to lift, move or transport heavy material) is potentially a very dangerous activity. Loss of control of heavy material can cause damage to valuable material, damage to the facility, personal injury, or even death.

- Mechanical material handling is performed by persons in many occupations and crafts, often as a "routine" or "skill-of-the-worker" part of their daily jobs.

- It is important to review all mechanical material handling activities at each DOE site. Employees and contractor personnel performing these activities must have appropriate training (classroom and practical skills) for all the equipment and techniques used (e.g., overhead cranes, forklifts, incidental rigging, load securement, equipment inspection, etc.) Specialized crafts that routinely perform complex mechanical material handling evolutions (riggers, heavy equipment operators, mobile crane operators) require in-depth training, testing and qualification to demonstrate their competency for this work.

- It is also important to have programs and procedures in place to ensure that material handling equipment and related accessories (e.g., cranes, forklifts, slings, chain falls, lifting devices, etc.) are properly specified and procured (to preclude purchase of inferior quality, suspect and counterfeit equipment) and periodically inspected in accordance with DOE, OSHA and manufacturer's requirements (to ensure all equipment is in sound working order).

17. **Title:** Recognition of Changed Condition - Overhead Obstacles Present Potential Hazards During Movement of Lifting Equipment Via Site Roadways

Summary: Routes used by lifting equipment with booms or masts that have the potential to contact overhead obstructions should be evaluated to ensure the equipment has sufficient clearance to safely negotiate overhead obstacles. Project Environmental, Safety & Health (ES&H) should ensure operators and/or spotters walk down the route prior to initial movement of lifting equipment along the route to identify potential hazards. Potential hazards associated with movement of lifting equipment should be identified in work control documents.

18. **Title:** Overflow of Cold Chemical Tank-Includes Best Practice

Summary: Tank calibration chart information should be based on water specific-gravity and pounds and should be consistently implemented throughout a facility.

Best Practice

Senior Supervisory Watch (SSW) was used during this initial transfer since it was a first-time activity. The person performing the SSW function noted the tank overflow and directed the operator to stop the transfer.

19. **Title:** Strontium-90 Source Transfer Leads to Facility Contamination

Summary: 1. When planning tasks or activities, all facility structures, systems or components should be evaluated for applicability or impact on the operation or task at hand.

2. When performing high activity source transfers with limited historical information, conservative radiological monitoring and controls must be implemented.

3. Field changes to approved technical work documents must receive the same level of review as the original documents authorizing work.

4. Operations must be monitored and controlled to preclude the spread of contamination. Monitoring must be thorough enough to detect the unexpected spread of contamination and response systems must be able to contain and control contamination until the source of contamination is determined and controlled.

5. Procedures or work planning should be thorough enough to include the unexpected spread of contamination and forward looking to include provisions to manage unanticipated situations safely and efficiently.

6. Strontium microspheres are highly charged particles that can be dispersed easily with the natural flow of air.

20. **Title:** Fixed Contamination Discovered on Flatbed Trailer Outside of a Controlled Area

Summary: Commercial truck drivers who are familiar with Department Of Transportation (DOT) requirements may not be familiar with Department of Energy (DOE) radiological control requirements. Prior to startup of a project involving shipping of radiological wastes from DOE sites, it is important to brief the shipper and drivers on DOE requirements and proper handling of trucks that contain radiological control tags.

21. **Title:** Response to Package Nonconformance (NTS Waste Boxes)

Summary: Upon discovery of a packaging nonconformance, it is important to quickly and aggressively address the situation with all associated support organizations (including the manufacturer), and to place an administrative hold on all associated packaging to preclude subsequent use, pending resolution of all issues.

A corrective action plan must be developed and implemented in a disciplined fashion, in order to mitigate potential impacts, and to ensure the integrity of all affected packagings.

22. **Title:** Water Supply to Two LCO Fire Suppression Systems Isolated Without Proper Compensatory Measures
Summary: Procedure problems and causes of delays must be resolved prior to the next performance of the inadequate procedure.

23. **Title:** Inadequately Developed Procedure Guidance for Operating Personnel Results in Personnel Contamination
Summary: Inadequate procedure guidance was provided to operating personnel performing work. Administrative procedures that provide guidance on the development of operating procedures should address identification of hazards, development of adequate controls, incorporation of controls in procedures, required procedure approvals, needed permits, etc.

24. **Title:** Air Cylinder Identification Markings
Summary: Air cylinders must be marked legibly on the neck ring per 49 CFR Section 173.34 (c). The many markings may be confusing, especially when local vendors add markings to identify lot numbers. This document describes the codes frequently seen on cylinders at Hanford.

25. **Title:** Insects in Respirator Bags
Summary: Insects can occasionally be found in sealed plastic respirator bags.

26. **Title:** Improperly Packaged Hazardous/Radioactive Material Classification Changed Conditions During Transportation
Summary: Hazardous and radioactive materials must be packed, secured and cushioned within the outer packaging to prevent their breakage, leakage and control movement of the material to ensure the conditions of the outer packaging remain unchanged under conditions normally incident to transportation.

27. **Title:** New Survey Technology Saves INEEL Time and Money
Summary: Engineers used new technology to characterize the floors of two buildings that had to undergo radiological surveys before they can be decommissioned and dismantled. The new process saved time and money, and it produced more accurate, readable data. These benefits show the need for continuous evaluation of new technologies to solve issues.

28. **Title:** Acceptance of Design Error Leads to Failure of Cooling Tower Sprinkler System
Summary: Review of design packages should pay close attention to accepted standards. Non-standard materials are not acceptable even when the error is discovered after installation. The use of non-galvanized steel pipe is not acceptable and shall not be specified in construction of cooling tower sprinkler systems.

Problem/Issue: On June 8, 1994, while Fire Department personnel were conducting tests of the sprinkler systems in Cooling Tower 9409-22E, four of the five sprinkler systems within the tower, including numerous sprinkler heads and spray nozzles, were found to be clogged. Fire Department assessment of the systems revealed an estimated 60 percent impairment due to degradation of the piping, which rendered the sprinkler systems inoperative.

29. **Title:** Subcontractors Providing Decisions

Summary: Subcontractors should not be tasked to make an MMES decision by reaching conclusions regarding hazard screening/hazard classification. Problem: Subcontractors which provide support to FSETs in the hazard screening process may reach a conclusion regarding facility hazard level that is not appropriate. Once reached and documented, MMES resources are required to correct the inappropriate conclusion AND explain why the subcontractor conclusion is incorrect. Past incidents have occurred in NFPA and seismic evaluations in which a subcontractor's conclusion was either incorrect or inappropriate, but the resolution of these incidents unnecessarily expended substantial MMES resources.

30. **Title:** Three Building D&D Project (BNFL) Lessons Learned Meeting Notes of November 16, 2000

Summary: The meeting was held to flowdown lessons learned from the DOE managed Three Building D&D Project (BNFL) to the K-25/27 D&D project team. The meeting began with introduction of the various members of the two project teams. Gary Person discussed the technical and procurement approaches that are anticipated for the K-25/K-27 D&D project. Discussion topics identified included: Radiological release of property, potential hazards, unforeseen (hidden) hazards and problems, and removal of property from property books

Jack Howard stated that the BNFL project had an IG audit which recommended that the BNFL project team share lessons learned with other DOE EM projects. Jack also wanted to use this opportunity to open communication channels with the K-25/K-27 D&D project. Meeting Minutes for this meeting will be used to document that the BNFL project team has shared lessons learned.

31. **Title:** ETTP Lessons Learned Teleconference with Greg Eidam on April 19, 2005

Summary: This summary is to capture the lessons learned from ETTP experience in preparing for D&D of the K-25/K-27 facilities. Based on this teleconference valuable information was exchanged in dealing with uranium and technetium contaminated equipment and the strategy to reduce the Hazard Category of the facilities prior to D&D.

Lessons Learned

6.0 Authorization Basis Transition

1. **Title:** Criticality Safety in a D&D Environment
   Summary: A number of valuable lessons regarding criticality safety have been learned from deactivation and decommissioning (D&D) activities within the DOE and from significant events in other communities, most notably Toki-Mura in Japan. The referenced document provides some of those key lessons learned that are expected to be valuable to facility and project managers planning D&D work.

2. **Title:** Incorrect Determination for the Unreviewed Safety Question Determination (USQD) for the Radiation Criticality Alarm System (RCAAS) Horn Installation
   Summary: FOR INTERNAL USE ONLY OFFICIAL USE ONLY

   NOTE: Contains information which may be exempt from public release under the Freedom of Information Act (5 U.S.C. 552); exemption number(s) 2 circumvention of statute information. Approval by the Department of Energy prior to public release is required.

   LESSON LEARNED STATEMENT: USQD preparers as well as reviewers and approvers should be cognizant of the equipment important to safety (EIS) identified within a facility's safety basis (SB) and any applicable technical safety requirements (TSRs) associated with that equipment. If a proposed change requires that a TSR be changed or modified, such as the addition of a surveillance requirement (SR) or limiting condition of operation (LCO) to accommodate for a new configuration, then the first question of the USQD should be answered "Yes" and the appropriate actions taken (i.e., DOE should be notified). USQD evaluators should not necessarily agree with the results of other review bodies, such as Configuration Control Boards, without a thorough evaluation of the applicable safety basis, which includes the TSR bases.

3. **Title:** Failure to Evaluate All Facility Safety Basis Documents for Compliance Concerns When Evaluating Potential As-Found Nuclear Criticality Safety (NCS) Conditions
   Summary: When evaluating potential as-found NCS conditions, it is required that all facility safety basis documents be evaluated for compliance concerns.

4. **Title:** Three Building D&D Project (BNFL) Lessons Learned Meeting Notes of November 16, 2000
   Summary: The meeting was held to flowdown lessons learned from the DOE managed Three Building D&D Project (BNFL) to the K-25/27 D&D project team. The meeting began with introduction of the various

members of the two project teams. Gary Person discussed the technical and procurement approaches that are anticipated for the K-25/K-27 D&D project. Discussion topics identified included: Radiological release of property, potential hazards, unforeseen (hidden) hazards and problems, and removal of property from property books

Jack Howard stated that the BNFL project had an IG audit which recommended that the BNFL project team share lessons learned with other DOE EM projects. Jack also wanted to use this opportunity to open communication channels with the K-25/K-27 D&D project. Meeting Minutes for this meeting will be used to document that the BNFL project team has shared lessons learned.

5. **Title:** ETTP Lessons Learned Teleconference with Greg Eidam on April 19, 2005

   Summary: This summary is to capture the lessons learned from ETTP experience in preparing for D&D of the K-25/K-27 facilities. Based on this teleconference valuable information was exchanged in dealing with uranium and technetium contaminated equipment and the strategy to reduce the Hazard Category of the facilities prior to D&D.

6. **Title:** Meeting Minutes on April 3, 2002 Discussion with DOE on BNFL Lessons Learned

   Summary: The meeting was held on April 3, 2002 from 9:00 to 12:30 PM to share lessons learned, recommendations, and general information from the BNFL Three Building D&D Project for Consideration and use on the K-25/K27 D&D Project

Lessons Learned

7.0 CD-0/1 and Revised Estimate

1. **Title:** Decommissioning Challenges at the Rocky Flats Environmental Technology Site

Summary: This paper presents a discussion of the demolition of the building 788 cluster at the Rocky Flats Environmental Technology Site (RFETS) in Golden, Colorado. The Building 788 Cluster was a Resource Conservation and Recovery Act (RCRA) permitted storage facilities and ancillary structures. Topics covered include the methods employed for Project Planning, Regulatory Compliance, Waste Management, Hazard Identification, Radiological Controls, Risk Management, Field Implementation, and Cost $ Schedule control, and Lessons Learned and Project Closeout.

Lessons Learned

8.0 CERCLA

1. **Title:** Fernald Closure Project Performance Management Plan November 2003

   Summary: This document presents the Performance Management Plan for the Fernald Closure Project near Cincinnati, Ohio. The Fernald Performance Management Plan outlines the strategic initiatives, execution strategies, and performance management approaches that form the backbone of the commitment of the Fernald team (DOE-OH and its closure contractor, Fluor Fernald) to achieve accelerated site closure by 2006. The Plan is aimed at satisfying National Defense Authorization Act (HR 4546) requirements for a high-level plan that defines activities needed to accelerate environmental risk reduction and cleanup, and which are fully coordinated with Federal and State agencies with regulatory jurisdiction over the site.